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RESEARCH IN MALARIA, FILARIASIS AND KALA-AZAR (1979-80)

MALARIA

Malaria is one of the diseases which has posed a challenge to biomedical scientists as well as the public health planners, on account of its recent resurgence. The Council has been alert to this problem ever since its resurgence and has intensified its research efforts on various aspects of malaria including its epidemiology, immunology, vector control as also the cultivation of the parasite with the ultimate aim of producing a vaccine against malaria.

ECOLOGICAL STUDIES

Malaria and its control in coastal villages of Pondicherry:

Sporadic cases of malaria have been occurring in many coastal villages of Tamil Nadu and Pondicherry. It has been reported that from Rameswaram (Tamil Nadu) right upto Vishakapatnam (Andhra Pradesh), there is constant movement of fishermen along the coast with many undetected passive carriers amongst them. Occasional outbreaks of malaria occur in many villages in the coast where the local mosquito vectors transmit the parasite. There were more than 100 positive cases of malaria reported in May-June 1979 in one of the coastal villages-Pudukuppam. On investigation, it was found that local transmission was taking place since even babies had been affected with malaria. However, no recognized vectors like *A. culicifacies* or *A. stephensi* were found. Being a coastal village, there were brackish water collections which supported *A. subpictus* breeding. This species was found breeding also in paddy fields and in other fresh water collections in pools and casuarina pits in these villages.

The results of laboratory infection experiments at the Vector Control Research Centre (VCRC), Pondicherry, showed that the salt water form of *A. subpictus* is capable of transmitting malaria. Studies are now in progress on the taxonomic status of the salt water forms and to find out whether there are any cytogenetic differences which determine vectorial susceptibility. So far, other related species like *A. indefinitus* and *A. vadakaniensis* have not been found. *A. varuna*, found breeding in wells in coastal villages, also did not develop oocysts/sporozoites in infection experiments.

Studies on malaria in Tamil Nadu:

The malaria problems faced by the state of Tamil Nadu at present include malaria in the coastal belt, particularly in the Rameswaram island; persistent transmission of malaria in the riverine belt of villages on the river Penniyar in the three adjoining district of South and North Arcot and Dharmapuri; and urban malaria. Though a general improvement in the malaria situation in the coastal and riverine localities was recorded in 1966 and 1967, there appears to have been a re-establishment of transmission by 1972. Since

then, the control of the disease in these two areas continues to be a problem.

Malaria in Rameswaram village:

The incidence of malaria which had declined to only 9 cases in 1970 gradually increased to 663 cases in 1973 and more than 3600 cases in 1974. Malaria incidence reached a peak, probably the highest in this decade, with more than 21,000 cases from January to August 1979.

Following the heavy north-east monsoon, all low lying areas get flooded with water which leaves behind innumerable pools with the gradual drying of water. All these form potential sources of breeding for *A. culicifacies*. The control of malaria in the situation existing in Rameswaram is challenging. In 1974, greater emphasis was laid on antilarval measures such as the use of Paris green. It is reported that by the treatment of all larval habitats using about 800 tonnes of Paris green during 1974, the incidence of the disease was brought down to about 2000 cases. Thereafter, only adulticidal measures appear to have been undertaken routinely. In 1978 and 1979, in view of the tremendous increase in the number of cases, antilarval measures using Abate in casuarina and coconut garden pits and wells along with adulticidal treatment using BHC 50 per cent and thermal fogging with 10 per cent malathion, were carried out. These measures do not appear to have given the desired results as apparent from persisting transmission of the disease. In addition, continuous movement of fishermen has created problems in radical treatment.

The antilarval measures undertaken with Abate in the casuarina and coconut garden pits have yielded good results, as revealed by the observations of the VCRC teams. Hence, in the prevailing situation in Rameswaram where casuarina and coconut garden pits significantly contribute to the breeding of vector(s), the feasibility of environmental manipulation with active community participation in closing down all the abandoned pits would offer the best hope for malaria control.

Malaria in riverine villages:

The transmission of malaria in the riverine belt of villages in the districts of North and South Arcot and Dharmapuri is maintained mainly by *A. culicifacies*. The river Penniyar is one of the potential sources of breeding for *A. culicifacies*.

The problem of malaria is an acute one in the vicinity of the Sathanur dam on the river Penniyar, where *A. culicifacies* is breeding in enormous numbers at the dam site, in the river bed, in irrigation channels and in paddy fields. *A. fluviatilis*, which had not been recorded for some years, has recently reappeared, and may be playing a subsidiary role as a vector. While malathion spraying has reduced case incidence and there is, as yet, no resistance reported for the vector, transmission has not been completely interrupted due to difficulties encountered in obtaining complete spray coverage of houses, outdoor transmission and outdoor resting by the vector. Due to the extensive nature of the breeding, antilarval measures appear to be difficult. Detailed studies of the epidemiological importance of various breeding habitats in different seasons, as well as adult biting and resting behaviour, are necessary in order to formulate alternative control strategies.

Urban malaria in Salem town:

The problems of urban malaria have been intensively investigated in Salem in Tamil Nadu, where in spite of control measures there has been failure to completely interrupt malaria transmission. The only common anopheline shown to be naturally as well as experimentally infected with the malaria parasite was the recognised vector, *A. stephensi*. *A. subpictus* which was numerically more abundant, was not infected when fed on gametocyte carriers in the laboratory, and is therefore unlikely to be playing a secondary role in maintaining transmission. It was concluded that because of the low cattle population within the town, *A. stephensi* was necessarily diverted to feeding mainly on man. In these circumstances, it is possible for transmission to continue in spite of the low vector density observed.

Breeding was mainly in wells (of which there were about 12,000) and also in cisterns and overhead tanks. It was observed that cases of malaria generally occurred in clusters around breeding sources, and when these were adequately treated, the occurrence of cases stopped. While *Gambusia* fish were effective in controlling mosquito breeding they themselves could not survive more than a week in many of the wells of the city, thus giving rise to operational problems of restocking them very frequently. Therefore, in 1976, the routine use of temephos in wells as a larvicide was started. In 1978, heavy breeding was

recorded under regular treatment with this insecticide. Careful investigation revealed that the dose being used, which was based on surface area rather than volume of water in the wells, was inadequate and that by using twice this strength, adequate control could be demonstrated. Obviously, therefore, a dosage schedule based on the volume rather than the area would be more satisfactory. Experiments were therefore carried out in the nearby town of Harur where there was heavy breeding in the absence of antilarval measures. It was found that following treatment with temephos at 0.1 and 0.05 ppm, wells remained free of breeding for a week and pupae were not found even after a fortnight. Weekly treatment at 0.01 ppm or fortnightly treatment at 0.05 or 0.1 ppm would be effective in Harur. Laboratory studies on comparative susceptibility of Harur and Salem strains showed a definitely higher tolerance of the Salem strain to temephos, and it was concluded that weekly treatment at 0.05 ppm or fortnightly treatment at 0.1 ppm might be required.

Based on these studies of vector ecology, it is obvious that an integrated approach to control would be most appropriate in Salem. All disused wells (about 2000 enumerated) should be sealed, and those in use in some problematic localities with large garden wells where fish survive should be stocked with *Gambusia*. This can considerably reduce the operational costs and difficulties of weekly treatment with temephos. Fortnightly treatment with 0.1 ppm should be tried,and periodic monitoring of susceptibility to the insecticide carried out. Overhead tanks should be provided with mosquito proof covers, and breeding cisterns treated with temephos. Adulticidal measures such as focal ULV fogging should be kept in reserve for epidemic outbreaks.

Ecology of anophelines in Basantpur village:

Observations on the ecology of anophelines in Basantpur village were continued during the year. The presence of six anophelines *viz.*,*A. subpictus*,*A.culicifacies*,*A. annularis*, *A. stephensi*, *A. hyrcanus* and *A. pulcherimus* was confirmed again in 1979. It was also confirmed that *A. subpictus* was the most dominant species followed by *A. culicifacies* which is the vector species of the area. The population of *A. culicifacies* starts building up in May and reaches peak densities in June, followed by sudden decline to low densities during the rest of the months. *A. culicifacies* mainly breeds in riverbed pools, margins of flowing drains, wells, burrowpits; flood water pools, rain water pools and agricultural fields. It was observed that during the monsoon, breeding of anophelines is mainly confined to the rain water pools or wells. However, the breeding of anophelines was observed throughout the year. Precipitin test (1831 blood smears) revealed anthropophilic index (per cent) of 20.4 for *A. annularis*, 26.3 for *A. culicifacies*, 20.0 for *A. hyrcanus* and 25.4 for *A. subpictus*. Insecticide susceptibility tests revealed that *A. culicifacies*, *A. stephensi* and *A. subpictus* were resistant to DDT and dieldrin. *A. stephensi* and *A. subpictus* were also resistant to malathion. *A. annularis* was resistant to DDT but susceptible to dieldrin. All anophelines were susceptible to Abate.

Vector studies in the Tarai region:

In August 1979, a research team of the Malaria Research Centre (MRC), Delhi, was deputed to visit Rudrapur in district Nainital (UP), for indepth epidemiological and entomological observations of the Tarai region. Between 1977 and 1979,the incidence of malaria was found to be very high according to the reports of the Primary Health Centres. The region is endemic for malaria. High density of anophelines was recorded in Tarai village. Per man hour hand catch index varied from about 50 to 450. The main anopheline fauna in the months of August, September and October consisted of *A. culicifacies*, *A. subpictus* and *A. annularis*. In late October and November, *A. fluviatilis* was also observed in a few villages.

A MRC survey during the year revealed that *A. culicifacies* is the only known vector found in reasonable densities. There was complete absence of *A. minimus* and *A. stephensi* and low densities of *A. fluviatilis* were found in a few pockets near Tanakpur. Man-biting collections (hourly collections from 6 PM to 6 AM) were carried out in 6 villages of the Tarai region. In these collections, Culex mosquitoes were found feeding in high numbers, the peak biting time for the indoor and outdoor collections was at night between 12 PM to 2 AM and very few anophelines were collected. *A. subpictus* was found in very high densities and almost all anopheline breeding was associated with the irrigation practices. The preferred resting places of *A. subpictus* were hanging objects whereas for *A. culicifacies* and *A. annularis* they were walls, crevices *etc.* From the available records it was found that *P. malariae* cases have not been recorded

since 1961. *P. falciparum* cases registered a sharp decline after 1961 and almost none occurred in 1977-78. No *P. falciparum* case was recorded in 1979. Malaria in Tarai is due to *P. vivax*.

Vector colonization:

Strains of *A. culicifacies* collected from Aurangabad (Maharashtra) and Gopalpur (Gujarat) in 1978 and from Rudrapur (UP) in 1979 were subjected to colonization procedures at the MRC laboratory, Delhi. Healthy and vigorous colonies of these strains have now been established. Techniques have been perfected to a point that it is now possible to mass produce mosquitoes of any of these strains for experimental work. The insemination rate in these strains varied from 70-80 per cent and the egg hatch was about 90 per cent. For genetic studies, efforts were made to sustain the colonies of *A. culicifacies* on a continuing basis in small cages (30 x 30 x 30 cm), and strains of mosquitoes have now been maintained in these cages for about 1 year. Efforts were also directed for single pair mating in small cages of 15 x 15 x 15 cm size. In these cages about 10 per cent insemination was achieved. Egg laying of individual females in the specimen tubes was achieved in 50 per cent cases.

MRC is maintaining a total of 45 strains of *A. stephensi* and *A. culicifacies*. These mosquito strains either belong to different geographical regions or have been selected for susceptibility or resistance in respect of DDT/HCH/malathion or have been isolated as pure lines for the biochemical or morphological variants.

Cyclic colonies of the following species are being maintained at the VCRC, Pondicherry: *Culex fatigans, C. sitiens, C. tritaeniorhynchus, Toxorhynchites splendens, Armigeres subalbatus, Aedes aegypti, A.stephensi* (normal strain), *A. stephensi* (black mutant), *A. culicifacies* and *A. subpictus*. The last named species was successfully colonized for the first time. Regular supply of larvae and adults of these species for experimental purposes in other sections has been maintained. In addition, long-term studies on the laboratory biology of the different mosquito species and on the ecology and behaviour of *A. subpictus* are also in progress.

BIOLOGICAL CONTROL

Studies on the development and use of biological control agents are being made on a continuing basis in a search for alternate methods of control. In certain situations like paddy fields, no other method of control would succeed (which includes the use of insecticides and environmental methods) and biological agents alone seem to offer some hope.

Bacterial agents:

So far, 13 entomotoxic bacterial agents have been isolated and studied in the laboratory, and some of them have been identified *viz.* strains of *Bacillus alvei, B. brevis, B. sphaericus, B. thuringensis* and *Serratia mercescens*. The other strains are still being studied. Laboratory studies on the pathogenecity of the agents against mosquitc larvae have been completed for all the identified agents. Amenability to mass culture, storage and economic application have been studied for *B. sphaericus, B. alvei* and *B. brevis*, which are now awaiting safety tests against non-target organisms. It has been found that these three agents could be mass cultured using simple inexpensive media and stored in peat for a period of six months without loss of virulence. Preliminary results indicate that they are potential candidates for use in the field against vector species breeding in paddy fields. Studies on their potential use in polluted environment like drains and cesspits are now in progress. Attempts are also continuing for isolating more entomotoxic agents from indigenous sources in Pondicherry and neighbouring areas of Tamil Nadu, and to increase the virulence of the available agents.

Fungal agents:

So far, apart from *Coelomomyces*, 16 strains of entomotoxic fungi have been isolated indigenously and are being studied. The isolation of *Metarrhizium, Beauveria* and *Fusarium* and their entomotoxic action on mosquito larvae have been reported earlier. During the year, a more virulent strain of *M. anisopliae* has been isolated, which kills mosquito larvae in the laboratory within six hours. In addition, another agent resembling *Lagenidium* has been isolated. This is the only agent which is pathogenic to *Ae. aegypti* apart from *C. fatigans* and *A. stephensi*. Being an aquatic fungus, this species is more adaptable for the aquatic ecosystem unlike the other three agents which are more adapted to terrestrial conditions. All these agents have now been mass cultured and techniques have

been developed to store the spores in inexpensive media like rice bran and pearl millet. The stored agents have a shelf life of six months.

Preliminary field trials with some of these agents in the paddy field ecosystem have been started. Their utility and limitations in control of mosquito larvae in different habitats and against different mosquito species are now in progress.

Coelomomyces is probably the only species which can completely kill the mosquito larvae. However, in order to complete its life cycle, an obligate intermediate host *(Cyclops, Daphnia etc.)* is necessary. From the natural habitat of *Coelomomyces*, fauna and flora have been collected and they are being cultured in the laboratory. Colonies of *Cyclops*, *Daphnia* and a few other ostracods, have been successfully established in the laboratory, and experiments are now in progress to establish cyclic colonies of *Coelomomyces* in the laboratory, before undertaking further studies on mass culture, storage and delivery systems.

Nematodes:

The nematode parasite *Reesimermis iyengari*, is maintained in the laboratory and millions of nema could be produced for use in field trials. Earlier studies had shown that this parasite is ineffective in polluted environment with high pH and salinity. The utility of this agent in controlling mosquito breeding in fresh water habitats is now being explored.

Fishes:

The utility and advantage of using *Aplocheilus blochii* over *Gambusia affinis* were demonstrated in a large scale field trial when over 3000 wells were seeded with them to control breeding of *A. stephensi*. This fish is now being cultured on a small scale at the VCRC, Pondicherry, and the Tamil Nadu Agricultural Polytechnic is developing mass rearing technology. All the wells in the coastal villages of Pondicherry are also being seeded with fish to control mosquito breeding.

Control of mosquitoes in paddy fields:

Paddy fields are the most important breeding places of mosquitoes in villages. They support round the year breeding of *A. subpictus*, *C. vishnui* group (including the vector of Japanese encephalitis, *C. tritaeniorhynchus*), *A. vagus* and a few other species. In view of the importance of *A. subpictus* as a major man-biting mosquito in villages and its suspected role in the transmission of rural filariasis and under some circumstances in malaria transmission, as also in view of the role of *C. tritaeniorhynchus* in the transmission of Japanese encephalitis, the paddy field mosquitoes are of utmost public health importance. A variety of insecticides are already being used in agricultural practices and therefore the mosquito species breeding in paddy fields are no longer amenable to control with insecticides.

Earlier studies at the VCRC, Pondicherry, have showed the presence of two mosquito parasites - *R. iyengari* and *Coelomomyces sp.* and low to moderate parasitism has been recorded in different months. Of these *Reesimermis* has already been mass cultured and is ready for use in the field. Two other entomotoxic pathogens, *Bacillus sphaericus* and a virulent strain of *M. anisopliae* which have been cultured and stored in low cost carrier material are ready for field use. Since all these agents have been isolated indigenously from paddy field mosquitoes, there is no danger of introducing any extraneous organism which may have an adverse effect on non-target organisms.

Necessary baseline data on the breeding of mosquitoes and their parasitism in the paddy field ecosystem have already been collected. The observations indicated that paddy fields with mosquito breeding can be seen almost throughout the year, because during the non-rainy season, tube well irrigation is employed. In individual paddy fields, breeding has been found from one week before planting and continues for about four weeks after planting, when the paddy plants reach a height of about 30-35 cm. There is a reduction in mosquito breeding when the paddy plants are over 40 cm high. On the basis of these findings, an experiment has been undertaken in a paddy field (50m x 40m) which was subdivided into 12 plots by constructing mud embankments. For optimum results on mosquito control, the parasites have to be introduced when the fields are being watered and ploughed and atleast two weeks before planting. This experiment will demonstrate the feasibility of mosquito control in paddy fields which could be of great benefit to villagers. Data will be obtained on the recycling of the parasites and pathogens in the ecosystem. The host-parasite relationship in the paddy fields with naturally occurring parasitism, the reasons for

the absence of parasitism in some fields and the disappearance of parasites in the later stages of paddy growth are also being studied.

IMMUNOLOGICAL STUDIES

Studies on Plasmodium gallinaceum and P. berghei infections:

The type of immunity in *P. berghei* infection in rats has been referred to as the 'sterilizing' type since the parasites in the host after recovery cannot be detected either by sub-inoculation or following splenectomy. The protective antibody as well as the cellular elements are believed to be involved in this type of immunity. In fowls, *P. gallinaceum* produces an acute infection followed by a crisis which results in a chronic state. The birds withstand rechallenge with the same parasite. Immunity is associated with the continued presence of the parasite at subpatent levels. An investigation was undertaken at VCRC, Pondicherry, to study the effect of two immunosuppressive agents *viz.* cyclophosphamide (Cy) and hydrocortisone (Hy), on the course of malaria in the two models representing the two type of immune responses. In rats which recovered from *P. berghei* infection, administration of the immunosuppressive agents did not reveal parasites. If such animals were rechallenged, the duration of parasitaemia was short in some cases and nonexistent in most of them indicating that the sterilizing immunity was least affected by the administration of these drugs. When the drugs were administered at a time when the parasite level was decreasing after the peaks, prolongation of parasitaemia was observed only in a few animals. In a majority of them this did not influence the regular course of infection.

In fowls with chronic *Plasmodium* infection, administration of Hy was found to be effective in recrudescing the infection. The parasite levels reached peaks comparable to those after primary challenge. Most of the animals died after Hy treatment. The effect of administration of Cy appeared to be dose-dependent. A dose of 75 to 100 mg/kg body weight was found to be effective in precipitating subpatent infection to patent levels. The parasite levels did reach significant heights in some birds. Hy/Cy when administered in the declining phase of infection after the crisis, were effective again in enhancing parasite level which reached a second peak and the birds succumbed to infection during this period.

Gut infection in mosquitoes fed on *P. gallinaceum* infected fowls, before and after Cy/Hy treatment during the chronic stage, was studied. Fowls were inoculated with blood stages of *P. gallinaceum* and *Ae. aegypti* were allowed to feed on 'infected birds' from the first day the parasites appeared in the blood, to several days after peak parasitaemia. Gut infection in mosquitoes increased with the increase of parasite level, but the maximum increase did not coincide with the peak parasite level. Generally, the infection in mosquitoes was less when fed at the time of peak parasitaemia and thereafter. This appears to be due to the development of antibodies to gametocyte.

Cy/Hy was administered to infected birds during declining phase of parasitaemia, and *Ae. aegypti* were fed during the second course of increasing parasitaemia observed after drug administration. The infection in mosquitoes followed a pattern similar to that observed when fed during the course of parasitaemia before drug treatment. Further, it was observed that relapse occurred during the chronic infection in birds. When mosquitoes were fed at the time of relapse, the development in mosquitoes proceeded in a normal manner. These findings suggest that gametocyte variants developed during chronic infection. The implications of these observations with reference to the studies on gamete vaccines are being investigated.

Experimental malarial infection:

Immunological studies in experimental malarial infection are being carried out at the Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh. Immunization with irradiated erythrocytic forms of *P. berghei* could induce some degree of immunity in rats and mice. It was observed that IgG antibodies protected against *P. berghei* infection by neutralisation of infectivity of the parasite. It was also shown that the protective antibody combined with free parasites (possibly merozoites). Infected erythrocytes did not seem to possess any receptor for this antibody.

The role of cellular immunity in malaria is also under investigation. Blastoid transformation of immune spleen cells by *P. berghei* antigen could be shown. Although this experiment suggested blastoid transformation to malarial antigen, its relation to protection is not known at present. Experiments also suggest that antibody-mediated, cell-mediated

and complement-mediated cytotoxic mechanisms operate together in *P. berghei* infection. It was shown that sensitized cells produce MIF. However, its role in protection is unknown at present.

The adoptive transfer of immunity to *P. berghei* with spleen cells in inbred rats could be demonstrated. Animals receiving normal splenic cells showed a mean parasitaemia of 20 per cent while those receiving immune cells had parasitaemia of 3.0 per cent only. Immunosuppressive drugs like cyclophosphamide enhanced the parasitaemia when given after the onset of latency.

Other investigations included isolation of merozoites of *P. knowlesi*, immunization of rhesus monkeys with merozoites of *P. knowlesi*, isolation of merozoite-antigen of *P. knowlesi* using polyacrylamide gel electrophoresis and affinity chromatography. In a preliminary study it has been found that *P. berghei* oocysts have immunizing potential. Further studies are to be carried out to confirm these preliminary observations.

IN VITRO CULTIVATION OF MALARIAL PARASITE

Studies on cultivation of the malarial parasite reported earlier were continued. At the National Institute of Communicable Diseases (NICD), Delhi, simultaneous propagation of *P. malaria* has been achieved. The culture is now 11 months old. *In vitro* continuous cultivation of *P. vivax* has been achieved in a mixed culture, which has been maintained for over 9 months. With the feeder-layer technique maturation of *P. knowlesi* and *P. vivax* has been achieved. Merozoites were recovered from the culture material by differential centrifugation. Apart from a high yield (10 to 12 per cent) of the malaria parasites, it has been found that the *in vitro* cultured parasites can be used as antigen in ELISA test for detecting malaria antibodies. However, the presence of cross-reacting antibodies is to be further investigated.

At the Department of Microbiology, St. John's Medical College, Bangalore, the FCR_3 strain of *P. falciparum* has been maintained by subculture and cryopreservation. It has been found that 3 to 4 per cent of the subculture on the 4th day are schizonts. These schizont-rich erythrocytes are being used for the preparation of antigen for serological work. IHA test showed that the antigen is comparable to the CDC antigen. The antigen from *in vitro* culture was found to be suitable for the IFA test also. It is proposed to purify the soluble antigen from *in vitro* culture of *P. falciparum* for initiating the ELISA test

P. falciparum (NICD strain) is being maintained in continuous cultivation at the National Institute of Virology, Pune. Different methods are being applied for better cultivation of the strain. The maximum percentage of parasitised erythrocytes in the culture was 52. Attempts were made to establish *P. vivax* culture. Two strains could be maintained up to 50-60 days. Studies on cryopreservation and revival of malaria parasites in erythrocytes are in progress.

Similar studies have been carried out at the PGIMER, Chandigarh. Indirect fluorescence test on the schizont stage of *P. knowlesi* is being standardised.

VECTOR GENETICS

Cytogenetics:

Proper evaluation of the different chromosomal/biological races or species complex by cytogenetic studies is essential for a better understanding of the epidemiology of malaria in an area. In south India, *A. culicifacies*, *A. stephensi* and *A. fluviatilis* are important vectors of malaria while *A. varuna* has been incriminated as a vector of lesser importance in some places.

Based on egg measurements, there are two races in *A. stephensi* - the *type* and *mysoriensis*, which need to be clarified by cytogenetic evidence. Mapping of polytene karyotype and measuring the eggs of *A. stephensi* collected from Salem, Harur, Cuddalore and Pondicherry reveal that the *type* form of *A. stephensi* is breeding in these areas and inversion with varied frequency is found. The presence of inversion in Salem, Harur and Cuddalore where indigenous cases of malaria occur, and the absence of urban malaria in Pondicherry where inversion is absent suggests that the vector susceptibility may be related to variation in the frequency of the inversion.

A. subpictus collected from fresh water and salt water habitats has been examined for morphological and genetic variants. The prehumeral area of the costa of the wings and the number of ridges on the egg float of *A. subpictus* breeding in brackish water were found to be different from that of fresh water breeding *A. subpictus*. It is necessary to study very closely the morphological and gene-

tic variations in *A. stephensi*, *A.culicifacies* *A. varuna* and *A. subpictus*. The relative abundance of any of the variants in different areas has to be established in relation to the vector status.

Methods were standardised during the year at MRC, Delhi, for the preparation of polytene chromosomes of *A. culicifacies*. For the first time, spontaneously occurring chromosomal aberrations on autosomes were observed in the preliminary analysis of the polytene chromosomes. Crossing experiments were done to test the hybrid sterility between the strains maintained at the MRC. It was revealed that no fertility barrier exists between the strains collected from Delhi, Gopalpur and Aurangabad. A naturally occurring morphological variant 'green larva' was observed in the laboratory colonies which could not be colonized.

Gene-enzyme system:

The technique of polyacrylamide gel electrophoresis is being used to study the non-specific esterases in *A. stephensi* and *A. culicifacies*. Ontogeny of esterases in *A. stephensi* has been completed. Studies on the esterases in adult male and female mosquitoes revealed that there was great variation in the number of bands within and in between the strains. A sex limited esterase band was localised in the male reproductive system in *A. stephensi*. Further studies in respect of other enzyme systems are in progress at the MRC, Delhi.

INSECTICIDE RESISTANCE

Insecticides and pesticides are being used extensively in agricultural practices in our country, and as a result resistance has developed in many mosquito species.

Base line data on the susceptibility status of common mosquitoes in Pondicherry have been obtained for commonly available insecticides. Adults of *C. fatigans*, *C. tritaeniorhynchus*, *A. subpictus* and *C. whitmorei* are resistant to organochlorines but are still susceptible to organophosphates and carbamates. Larvae of all these mosquito species and larvae and adults of *A. stephensi* *Ae. aegypti*, *C. sitiens* and *Armigeres subalbatus* are still susceptible to all insecticides.

Studies were carried out to predict resistance development in *C. fatigans*. The response of *C. fatigans* population in Pondicherry to selection for fenthion, DDVP, carbaryl and Abate showed that these insecticides could be used for a longer period without precipitating any resistance development due to the absence of resistant genes in the population. However, in the case of malathion, resistance can develop very fast *i.e.* within 10 generations (3 months). The phenomenon of reversal of malathion resistance in *C. fatigans* is being studied. Preliminary data show that malathion should be used cautiously because resistance may establish in neighbouring areas also as a result of migration of resistant populations.

Attempts are being made to develop some slow release insecticide formulations, although initial results with impregnated briquettes, floats and capsules have not been very encouraging.

Insecticides and repellants of vegetable origin are now being intensely studied. Extracts from 15 plants known to have insecticidal/repellant properties have been obtained and are being tested for larvicidal/adulticidal properties. Preliminary results are not very encouraging. Extracts taken freshly from *Ocimum* sp *(Tulasi)* and *Leucas aspera* gave some kill when used as larvicides. However, they lost the larvicidal properties after storage. Neem oil gave 100 per cent kill of adults of *A. stephensi*, *C. fatigans* and *Ae. aegypti* when exposed to impregnated papers in closed chambers. However, since neem oil has a distasteful smell, further studies are required before its use on a mass scale can be seriously considered.

A reassessment of the resistant status of all vector species in different parts of Tamil Nadu, is now being undertaken. The role of agricultural pesticides in resistance development in vectors of public health importance is also being investigated.

At the MRC, Delhi, insecticide susceptibility status of the available strains of *A. stephensi* and *A. culicifacies* was evaluated during the year. Tests revealed that *A. culicifacies* (Delhi) was fully susceptible to malathion while Aurangabad and Gopalpur strains showed varying degrees of resistance. Strains of *A. culicifacies* collected from Delhi, Aurangabad and Gopalpur were resistant to DDT and HCH.

Studies on the inheritance pattern of dieldrin resistant gene in *A. stephensi*

collected from Burhampur revealed varying degrees of dominance. The data are under analysis. For similar studies, malathion resistant lines of *A. culicifacies* (Aurangabad and Gopalpur) are being made homozygous. Several DDT and dieldrin resistant lines of *A. stephensi* and *A. culicifacies* from different areas have been isolated.

FILARIASIS

The Council continued its studies on the epidemiological, immunological and other aspects of filariasis in India including vector control.

EPIDEMIOLOGICAL STUDIES

Filariasis in rural Andhra Pradesh:

Epidemiological studies initiated in 1976 were continued at the NICD, Delhi. As reported earlier the study population comprised 17,517 in four villages in East Godavari District of Andhra Pradesh with very high endemicity for bancroftian filariasis. The Community was subjected, at 6 month intervals, to clinico-parasitological examination in order to determine the incidence of microfilariae (mf) and filaria disease rates.

During the year, the seventh and eighth re-examinations were undertaken after control measures in four villages *viz.* Alamuru,Angara, West Kandrika and Penekeru.

A number of control measures have been initiated from October 1978 in the villages under study. These include antilarval measures with temephos at monthly intervals and treatment of mf carriers with 108 mg DEC per kg body weight in 12 equal doses.

As compared to the fifth re-survey, the seventh and eighth re-surveys revealed marked reduction in mf rates (both prevalence and incidence) mean mf count and mfD_{50} in three villages under DEC treatment. Disease rates (either acute or chronic) did not show any significant variation after control measures in any of the four villages.

In West Kandrika, where only antilarval measures were undertaken, *C. fatigans* density has been greatly reduced with no change in vector infection and infectivity rates.

Rural filariasis in Pondicherry:

Filariasis has been looked upon mainly as an urban problem. However, several studies carried out in the recent past have revealed filariasis among rural populations. An extensive study has now been completed in 101 villages around Pondicherry. Blood samples were collected by finger prick from 10,522 villagers, and 348 were found positive, giving a rate of 3.3 per cent. The mf rates in different villages ranged from 0.3 to 15.1 per cent. Seventy five of 101 villages had mf carriers. The rates would have been much higher if membrane filteration concentration technique (MFC) was used. The results indicate that filariasis is as much a disease of the rural areas, as in an urban situation.

Studies on the possible vectors involved in the transmission of filariasis in rural areas were carried out. Data show that the four most dominant man-biting mosquitoes in the rural areas are,in the order of abundance, *A. subpictus*, *C. fatigans*, *C. vishnui* group and *A. vagus*. Natural filarial infection has been found in all the four species. The density of *A. subpictus* is about 10 times that of *C. fatigans*. Since the vector density has to be very high to maintain transmission, the role of *A. subpictus* was studied by experimental infection in the laboratory. Out of 1011 *A.subpictus* females fed on mf donors, 668 (66 per cent) were infected and 51 (0.5 per cent) developed infective stage larvae. There was a heavy mortality in the mosquitoes, as a result of filaria larval infection. However, the very high density of this mosquito breeding in vast areas in paddy fields surrounding the villages, poses a grave vector problem in the villages. The breeding of *C. fatigans* is limited to small polluted water collections, some drains and some disused wells.

Control of filariasis in Pondicherry town:

Control of filariasis has reached an almost stagnant stage in many parts of the country including Pondicherry which is highly endemic for filariasis. While mass DEC therapy could reduce the microfilaria level in the population and also reduce transmission, the control programme continues to be beset with a number of difficulties. Control of vectors to reduce transmission offers a reliable method, and if sustained, could eliminate new microfilaria carriers. Because of the limitations of insecticide control of *C. fatigans* - the major vector of bancroftian filariasis, a detailed five-year plan of study has now been drawn which will incorporate integrated control technologies. The main accent in this plan will be on environmental

methods. The total breeding potential has been determined for the whole of Pondicherry town. There are over 85 km of running drain, over 2000 cesspits, 3400 wells and innumerable cesspools. The relative importance of different types of habitats contributing to the total mosquito emergence has now been studied for different seasons.

During the post-monsoon dry season, the drains contributed to 89.9 per cent of the mosquito emergence, while the cesspits contributed to 8.6 per cent of the total emergence. During the rainy season, on the other hand, the cesspits are major habitats contributing to 44.6 per cent of the total breeding surface area, the drains (35.4 per cent) and wells (17.0 per cent) being of lesser importance. The total daily emergence estimated in Pondicherry (10 sq km) varies from a high 9.6 million per day in January to a low 172 thousand in November. All major mosquito breeding habitats have been mapped out and it is hoped that control of filariasis may be achieved by vector control in a big town like Pondicherry.

MICROFILARIA DETECTION

In the microfilaria surveys carried out by the local Filaria Department, only three of 20 blood samples were found positive for microfilaria, while when blood samples were collected from the same 20 cases and tested for mf by the MFC technique at the VCRC, Pondicherry, 15 were found to be mf carriers *i.e.* there was a five-fold increase in the mf rate as compared to the finger prick method. At the request of the State Filaria Department, about 100 mf carriers are being followed in order to test the efficacy of DEC. These cases, after being confirmed as mf carriers by the MFC technique, are being given the full regimen of DEC treatment during the following three weeks, and are being tested later at intervals of one week after completion of DEC treatment, and again after an interval of another week. Data on 20 cases have now been obtained. Only three treated cases showed mf by the finger prick method, whereas 15 out of 20 treated cases showed mf by the MFC technique. The studies are being continued.

The utility of MFC technique in detecting unrecognised mf carriers has been demonstrated. The data show that for every microfilaria carrier detected in the community during routine surveys, there are 4 more who escape detection. Since 1 ml of blood has to be taken from a person for the MFC technique, this method may not be practicable in mass surveys, due to public resistance. However, in a controlled experiment, a conversion factor for each area can be obtained which would give a realistic estimate of the microfilaria rate in the population.

VECTOR STUDIES

Initial surveys by MRC, Delhi, revealed that *Culex* populations were very high and almost always exceeded that of anophelines in the Tarai region of Uttar Pradesh. Among Culicines, *C.p. fatigans* and *C. vishnui* group of mosquitoes occur in high numbers. The Filaria Survey Unit (Rudrapur) collected 6820 blood smears from the area (not all smears could be examined). Of these, 84 were found positive. The region has now become endemic for filaria.

IMMUNOLOGICAL STUDIES

Blood samples of 113 adults of Pondicherry - a hyperendemic area for filariasis - comprising 88 subjects with *Wuchereria bancrofti* infection and 25 non-infected individuals, were examined for total and differential WBC counts and lymphocyte subpopulations by E and EAC rosette tests. In the infected group it was observed that there was an elevation of eosinophil count and reduction in the neutrophil count. The total lymphocyte count was unaltered. Among the subpopulation of lymphocytes, EAC rosette forming cells (B cells) remained unchanged. Total E rosette forming cells (T cells) were less in the group with clinical manifestations like elephantiasis, hydrocele, lymphangitis and lymphadentis. Loss of functional lymphocyte (T_{10}) was seen in the group with clinical manifestations, who were treated with DEC and other supportive drugs. The group consisting of individuals with microfilaraemia did not show any alteration either in functional lymphocytes or in total T cells. Non-T and non-B cells (null cells) showed an increase in untreated clinical cases of mf carriers. Preliminary tests with the sera of patients indicated the presence of factors that inhibit rosette formation. Studies are in progress to characterize these factors.

Immunological studies with human filariasis infection are also being carried out at the PGIMER, Chandigarh. The results so far obtained show that albino rats and birds have not been found susceptible to human parasite *(W. bancrofti)* infection even after immunosuppressive therapy.

A number of studies revealed the presence of common antigens between the rat parasite *(Litomosoides carinii)* and *W. bancrofti*. The second fraction from sephadex G-200 columns of adult *L. carinii* antigen reacted maximally with sera from filariasis patients.

Studies on the immunological factors operating in subjects living in endemic areas of filariasis revealed the importance of collaboration of antibodies with cells of the host in containing the filarial infection. These antibody-dependent, cell-mediated reactions have been found to play an important role in limiting the filarial infection. Evidence has been obtained that the amicrofilaremic condition in subjects with elephantiasis and apparent resistance exhibited by certain individuals living in endemic areas could be due to these immune mechanisms operating against the parasite.

Radiation-attenuated infective larvae have been shown to induce protection against infection in experimental animals. It has been demonstrated that DEC requires host immune factors for exerting its optimal microfilaricidal effect.

Studies on filariasis and tropical eosinophilia at the Tuberculosis Research Centre, Madras, indicate that nuclepore filter technique is a sensitive method for screening a population for microfilaria and for determination of the parasite load. DEC provocation test seems to be a useful pharmacological manoeuvre for the detection of nocturnally periodic microfilariae in diurnal examination. This technique can replace night blood examination. Skin test with highly purified Sawada antigen FST-3 has been found to be of limited use in endemic areas as a diagnostic tool. Lung function tests done on tropical pulmonary eosinophilia patients showed a combined restrictive and obstructive defect. These patients showed elevated serum IgE, high antifilarial IgG antibodies and reactivity to human microfilarial antigen in histamine release assay system and leucocyte migration inhibition assay. These observations suggest that tropical pulmonary eosinophilia may be due to hypersensitivity reactions to human microfilariae and not an abnormal response to non-human microfilariae, as hitherto suggested.

Patients with asymptomatic microfilariaemia showed lower titres of antifilarial IgG, serum IgE and low reaginic antibodies, as assessed by histamine release assay system. This suggests that in these individuals the immune system does not mount a hostile reaction against the parasite, thus allowing the host and the parasite to stay together without causing apparent discomfort.

KALA-AZAR

In the wake of the recent resurgence of kala-azar in various parts of India, the Council has initiated several studies on the clinical, immunological and therapeutic aspects of the disease as also in its vectors.

IMMUNOLOGICAL STUDIES ON KALA-AZAR

Studies on the immunological mechanisms in kala-azar (KA) and post-kala-azar dermal leishmaniasis (PKADL) are being continued at Calcutta. Detailed serological analysis was carried out in kala-azar and PKADL patients. Alterations in the immunoglobulins and C_3 levels were less marked in PKADL sera compared to those found in kala-azar. Specific antibodies to leishmania antigen could be demonstrated in most of the PKADL sera by both indirect haemagglutination (IHA) and micro-ELISA tests, although the latter was more sensitive than the former. As was the case with kala-azar, antileishmanial activity of PKADL sera was mainly associated with the IgG class of antibody. However, serological titres of PKADL sera were found to be lower than those of kala-azar sera. It was interesting to note that fresh PKADL cases rather than chronic ones demonstrated higher antibody levels. In addition to IHA and micro-ELISA techniqjes, kala-azar and PKADL sera were also subjected to counter-immunoelectrophoresis (CIEP) against a soluble leishmanial antigen. Results obtained so far indicate that CIEP is a rapid and sensitive serodiagnostic method for both kala-azar and PKADL, although false positivity limits its applicability for routine purposes.

Studies on the cell mediated immunity of kala-azar demonstrated the impairment of T-lymphocyte function during the active phase of the disease. Specific leishmanial antigen failed to induce lymphocyte transformation *in vitro* in a few active kala-azar patients studied so far. Further studies are in progress to determine the mechanism of altered immunological responsiveness in kala-azar.

VECTOR OF KALA-AZAR

During November and December 1979, a total of 686 female sandflies collected from

indoor and outdoor habitats from kala-azar affected villages in Muzaffarpur district, Bihar, were dissected to observe natural lepromonad flagellate infection. In all, 27 sandflies of which 24 were *Phlebotomus papatasi*, one *P. angentipes* and two *Sergentomyia babu*, were found positive. This finding suggests the possibility of *P. papatasi* being involved in the transmission of kala-azar in this area.

ZOONOTIC RESERVOIR OF KALA-AZAR

Search for a probable zoonotic reservoir of Indian kala-azar is being carried out by the NICD, Delhi. Out of the 67 dogs examined, only two were found to be positive while two gave doubtful results by aldehyde test. By ELISA test also two sera were found to be positive and one doubtful while other tests gave negative results. From the spleen of one of the dogs, leishmania-like organisms were obtained. Among the 9 pigeons examined one gave doubtful results by aldehyde test, whereas the other tests were negative. The other animals examined were all found to be negative.

CLINICAL TRIAL OF DRUGS IN KALA-AZAR

At the District Hospital, Muzaffarpur (Bihar), therapeutic trials of some drugs or combination of drugs for kala-azar are being carried out. The effect of drugs like trimethoprim-sulphamethoxazole, metronidazole, diaminodiphenyl sulphone (DDS) and cycloguanil pamoate (Paludrin); and drug combinations like trimethoprim-sulphamethoxazole and DDS; and trimethoprim-sulphamethoxazole and cycloguanil pamoate are being evaluated. The study is in progress.

SHAKUNTALA AMIR CHAND PRIZE (1979) LECTURE

Dr. H.V. Bhatt, Research Officer, National Institute of Occupational Health, Ahmedabad, delivered the Shakuntala Amir Chand Prize (1979) Lecture on Central Cholinergic Mechanisms of Sleep at the Indian Council of Medical Research, New Delhi, on 18th December, 1980.

Intracarotid or vertebral arterial administration of the cholinergic agonists (ACh, pilocarpine, nicotine), anticholinesterases (physostigmine and neostigmine) and cholinolytic drugs (d-tubocurarine, atropine and hexamethonium) induced sleep with differences in the duration of the two phases and in the frequency of rapid eye movement (REM) sleep in unanaesthetized dogs. The ACh release into ventricular perfusates was enhanced during REM sleep and wakefulness. Physostigmine and neostigmine irrespective of parental or intracerebroventricular (ICV) application at certain dose levels increased the ACh output into liquor space which shows a bearing on non-REM (NREM), REM sleep and wakeful states in unrestrained dogs. Further, these drugs (particularly tubocurarine, physostigmine, pilocarpine, nicotine, atropine and hyoscine), when given into the inferior horn and the body of the lateral ventricle in conscious dogs showed more spells of dose-dependent REM sleep. A site, probably hippocampus, for sleep induction by these drugs has been ascribed and localised in the structures lining the inferior horn of the lateral cerebral ventricles. The mode of action could be a depolarizing block for cholinomimetics and a competitive block by cholinergic antagonists. Variable induction of REM sleep, on exposure of brain, by drugs in this study opens new avenues in psychopharmacology. The cholinergic neurons trigger REM sleep to replenish the supply of catecholamines in the lateral mesencephalic reticular formation in order to meet the demands of enhanced neural activity during arousal and memory consolidation. Subsequent synaptic fatigue again activates the cholinoceptive mechanisms of sleep proportionally to the degree of catecholamine depletion and the whole sleep-wakefulness cycle represents a feed-back mechanism similar to food and water consumption cycles in a circadian rhythm.

ICMR AIDED SYMPOSIA/SEMINARS/WORKSHOPS/CONFERENCES

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
X National Conference on Communicable Diseases.	January 2-4, 1981	TN Medical College, Bombay (Indian Association for Communicable Diseases).

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
International symposium on Lectins as Tools in Biology and Medicine.	January 7-9, 1981	Institute of Experimental Medicine, Calcutta.
Workshop on Contact Dermatitis.	January 7-10, 1981	MGM Medical College, Indore (Indian Association of Dermatologists, Venereologists and Leprologists).
Workshop on Vitreous and Retinal Detachment Surgery and Symposium on Guidelines for Teaching and Research in Ophthalmology.	January 9-13, 1981	RNT Medical College, Udaipur (All India Ophthalmological Society).
Seminar on Postgraduate Medical Education - Training and Evaluation.	January 16-18, 1981	Osmania Medical College, Hyderabad (Indian Association for the Advancement of Medical Education).
Second Special Symposium on Natural Radiation Environment.	January 19-23, 1981	Bhabha Atomic Research Centre, Bombay (Indian Association for Radiation Protection).
XXXIII Annual Conference of the Association of Otolaryngologists of India.	January 21-24, 1981	Nalanda Medical College, Patna.
Sixth Annual Conference of the Environmental Mutagen Society.	January 27-29, 1981	Saha Institute of Nuclear Physics, Calcutta.
COGENE Course on Recombinant DNA Techniques.	February 2-22, 1981	Department of Biochemistry, Institute of Medical Sciences, Banaras Hindu University, Varanasi.
National Seminar on Infections of Central Nervous System.	February 10-12, 1981	All India Institute of Medical Sciences, New Delhi (National Academy of Medical Sciences).
Conference on Fifty Years of Electron Microscopy.	February 16-18, 1981	Indian Institute of Science, Bangalore (Electron Microscope Society of India).
Symposium on Primary Health Care - World Strategy.	February 23-26, 1981	All India Institute of Hygiene & Public Health, Calcutta (World Federation of Public Health Associations).
Symposium on Cancer Chemotherapy.	February 27-28, 1981	KG Medical College, Lucknow (Indian Association of Cancer Chemotherapists).

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
Seminar on Primary Health Care-World Implementation Experiences.	February 28 - March 2, 1981	Institute of Medical Sciences, Banaras Hindu University, Varanasi.
Workshop on Standardised Analysis of Diagnostic and Socio-demographic Data at the National Level.	March, 1981	Department of Psychiatry, Postgraduate Institute of Medical Education and Research, Chandigarh (Indian Psychiatric Society).
Workshop on Techniques Employed in Light Microscopic Studies for Biology Teachers.	March, 1981	Department of Anatomy, Postgraduate Institute of Basic Medical Sciences, Madras.
Workshop on Community Health Volunteer Scheme and Alternative Approaches.	March, 1981	Chandigarh (Institute of Economic Growth, Delhi.
First All India Symposium and Workshop on Anaerobic Infections in Man.	March 14-23, 1981	Department of Microbiology, All India Institute of Medical Sciences, New Delhi.
Public Health Problems in Desert Environment.	April, 1981	SMS Medical College, Jaipur.
Symposium on Photophysical and Photochemical Process in Chemical and Biological Systems.	April 14-16, 1981	Mahabaleshwar (Indian Photobiology Society).

ICMR NEWS

Task Force/Expert Group Meetings:

The following Task Forces/Expert Groups met during the month at the Council:-

Steering Committee of the WHO Task Force on Oral Contraceptives	January 12-15, 1981
ICMR Expert Group on Phenomenology and National History of Acute Psychosis	January 21-23, 1981
ICMR Expert Group on Influenza	January 27, 1981
ICMR Expert Group on Illness Behaviour in patients presenting with pain	January 28-30, 1981
Advisory Committee of the National Nutrition Monitoring Bureau	January 28, 1981

Lectures/Conferences/Awards:

Dr. V. Ramalingaswami delivered the INSA Anniversary Address on Modern Biology and Medical Advance at Varanasi on January 1, 1981.

Dr. B.N. Saxena, Director, Institute for Research in Reproduction, Bombay, participated in the Steering Committee meeting of the WHO Task Force on Long-acting Agents for the Regulation of Fertility, held at Kuala Lumpur between January 5-8, 1981.

Dr. V. Ramalingaswami, Director-General, ICMR, inaugurated the First Afro-Asian Conference on Burns at Bombay, on January 14, 1981.

Dr. V. Ramalingaswami delivered the Dr. Pinnamaneni Narasimha Endowment Lecture on Perspectives in the Conquest of Tropical Diseases at Nagarjuna University, on January 19, 1981.

Dr. V. Ramalingaswami was awarded the first Rameshwardas Birla Smarak Kosh Award in Bombay, on January 20, 1981.

Dr. G.V. Satyavati, Deputy Director-General, ICMR, participated in a meeting of the Expert Committee for the National Information Centre on Drugs and Pharmaceuticals (NICDAP) at Lucknow, on January 24, 1981.

Prof. David Penington, Chairman, Department of Medicine, St. Vincent's Hospital, Fitzroy, Victoria, and Dean, Faculty of Medicine, University of Melbourne, Parkville, Victoria, Australia, delivered a lecture on 'Platelets and the Vessel Wall' at the Indian Council of Medical Research, on January 30, 1981.

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The Filariasis Control Demonstration Project of the Vector Control Research Centre, Pondicherry, was inaugurated in Pondicherry, on January 9, 1981.

New Appointments:

Dr. S.K. Bhattacharya, Dr. J.R. Parikh, Dr. A.L. Aggarwal, Dr. Aruna Dewan and Dr. H.V. Bhatt, Research Officers at the National Institute of Occupational Health, Ahmedabad, have been appointed as Senior Research Officers.

ICMR AWARDS

The Indian Council of Medical Research has awarded the following prizes to scientists for outstanding research work in various fields of biomedical sciences:

BASANTI DEVI AMIR CHAND PRIZE, 1981
(for Biomedical Research)

Dr. N.C. Nayak,
Professor of Pathology,
All India Institute of Medical Sciences,
New Delhi.

Liver diseases - Human and experimental.

DR. Y.S. NARAYANA RAO ORATION AWARD, 1980
(for Microbiology)

Dr. Maharani Chakravorty,
Professor of Biochemistry,
Institute of Medical Sciences,
Banaras Hindu University,
Varanasi.

Regulation of metabolism in unicellular organism.

DR. V.N. PATWARDHAN PRIZE, 1980
(for Nutrition Research)

Dr. G.P. Kattiyar,
Reader in Pediatrics,
Institute of Medical Sciences,
Banaras Hindu University,
Varanasi.

Nutritional deprivation: Brain growth and functions.

SANDOZ ORATION AWARD, 1980
(for Cancer Research)

Dr. B.D. Gupta,
Chairman,
Department of Radiotherapy,
Postgraduate Institute of Medical
Education & Research,
Chandigarh.

Radiation therapy for cancer cervix.

JALMA TRUST FUND ORATION AWARDS, 1980
(for Leprosy)

Dr. K.V. Desikan,
Director,
Central Jalma Institute for Leprosy,
Agra.

Experimental leprosy.

Dr. C.K. Job,
Professor of Pathology and Principal,
Christian Medical College,
Vellore.

Pathology and pathogenesis of deformities in leprosy.

KSHANIKA ORATION AWARD, 1980
(for a woman scientist)

Dr. K. Prema,
Assistant Director,
National Institute of Nutrition,
Hyderabad.

Evaluation of methods for fertility regulation.

DR. KAMALA MENON MEDICAL RESEARCH AWARD, 1980
(for Internal Medicine)

Dr. George Cherian,
Professor of Cardiology,
Christian Medical College,
Vellore.

Rheumatic fever and rheumatic heart disease.

DR. M.K. SESHADRI PRIZE, 1980
(for Practice of Community Medicine)

Dr. R.N. Basu,
Assistant Director General,
Directorate General of Health Services,
Ministry of Health & Family Welfare,
New Delhi.

Eradication of smallpox from India.

DR. M.N. SEN ORATION AWARD, 1980
(for Practice of Medicine)

Dr. P.N. Tandon,
Professor of Neurosurgery,
All India Institute of Medical Sciences,
New Delhi.

Neurosciences specially head injury and CNS tuberculosis.

RAJA RAVI SHER SINGH OF KALSIA MEMORIAL AWARD, 1980
(for Cancer Research)

Dr. R.J. Dash,
Associate Professor of Endocrinology,
Postgraduate Institute of Medical
Education & Research,
Chandigarh.

Hormonal markers for cervical cancer.

SHAKUNTALA AMIR CHAND PRIZES, 1980

Dr. Sureswar Mohanty,
Head, Neurosurgery Section,
Department of Surgery,
Institute of Medical Sciences,
Banaras Hindu University,
Varanasi.

Head injury.

Dr. V.K. Vinayak,
Assistant Professor of Parasitology,
Department of Experimental Medicine,
Postgraduate Institute of Medical
Education & Research,
Chandigarh

Pathological and immunological aspects of amoebiasis.

Dr. S.C. Manchanda,
Assistant Professor of Cardiology,
All India Institute of Medical Sciences,
New Delhi.

High altitude physiology.

Dr. Vinod Kochupillai,
Lecturer in Medicine,
All India Institute of Medical Sciences,
New Delhi.

Fetal liver transplantation in aplastic anemia.

COUNCIL'S TRAINING PROGRAMMES FOR 1981

Leprosy:

At the Central Jalma Institute for Leprosy, Agra:

Training course in Leprosy for medical officers: (February 15 to March 28, 1981, and August 31 to October 14, 1981).

Virology:

At the National Institute of Virology, Pune:

(1) Diploma course in Medical Virology of Poona University: (July, 1981).

(2) *Workshop on Japanese Encephalitis in India

Endocrinology:

At the National Institute of Nutrition, Hyderabad:

Annual certificate course in Endocrinological Techniques and their Application: (August to September, 1981).

Nutrition:

At the National Institute of Nutrition Hyderabad:

(1) Summer School in Health and Nutrition for science teachers from Teachers' Training Institutes: (May/June, 1981).

(2) Annual certificate course in Human Nutrition for teachers from Agricultural Universities: (June/July, 1981).

(3) M.Sc. (Applied Nutrition) course: (June 1, 1981 to February 28, 1982).

(4) Annual certificate course in Public Health Nutrition: (October/November, 1981).

(5) Annual certificate course in Nutrition: (December 1, 1981 to February 28, 1982).

Haematology:

At the Blood Group Reference Centre, Bombay:

(1) A certificate course in Blood Banking Technology and Basic Haematology for medical officers: (February 1 to March 15, 1981).

(2) Training course in Blood Banking Methodology for technicians: (May 12-26, 1981).

Occupational Health:

At the National Institute of Occupational Health, Ahmedabad:

NIOH/WHO Training Course on Air Pollution and Health: (June, 1981).

Clinical Pharmacology:

*At the Department of Pharmacology, Seth G.S. Medical College, Bombay.

Biostatistics:

At the Institute for Research in Medical Statistics, New Delhi:

(1) Certificate course in Planning and Evaluation of Health Programmes: (April, 1981).

(2) Diploma course in Biostatistics: (September, 1981).

(3) Certificate course in Orientation to Biostatistics: (September, 1981).

(4) Certificate course in Statistical Techniques in Medical Research: (January, 1982).

COURSES FOR TALENT SEARCH SCHEME FELLOWS

Haematological Techniques:

*At the Department of Pathology, Christian Medical College, Vellore.

Use of Radioisotopes in Medicine:

At the National Institute of Nutrition, Hyderabad: (July, 1981).

Cell-Biology and Cyto-Genetics:

At the Indian Institute of Science, Bangalore: (October, 1981).

Immunological Techniques:

At the Central Jalma Institute for Leprosy, Agra: (November 10-25, 1981).

Clinical Endocrinology:

*At the Institute for Research in Reproduction, Bombay.

* Dates to be announced later.

PROGRAMME OF SCIENTIFIC LECTURES AT THE INDIAN COUNCIL OF MEDICAL RESEARCH, NEW DELHI

Date	Topic	Speaker
15.1.1981	Immunology of Leprosy (Jalma Trust Fund Oration Award 1979)	Dr. G.P. Talwar New Delhi
29.1.1981	Studies on Nutritional Anaemias	Dr. S. Swarup Mitra, Calcutta.
12.2.1981	Clinical and Experimental Manganese Toxicity (Kshanika Oration Award 1979)	Dr.Satyawati Chandra, Lucknow.

SOME ICMR PUBLICATIONS

	Price Rs.
Memorandum on Treatment of Leprosy with Sulphones (1952)	0.37
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Review on Haematology with a Note on Criteria for Averages and Normals (1953)	1.00
Treatment and Hygienic Disposal of Lac Wastes (1954)	0.62
Memorandum of Poliomyelitis (1955)	0.50
Tuberculosis in India: A Sample Survey, 1955-58 (1959)	2.00
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Menus for Low Cost Balanced Diets and School Lunch Programmes Suitable for North India (1959), Second Edition 1977	1.50
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Atlas of Histopathology of Liver: Hepatitis and Cirrhosis (1974)	10.00
Studies on Pre-School Children (1974), Reprinted 1977	3.50
Studies on Weaning and Supplementary Foods (1974), Reprinted 1977	4.00

	Price Rs.
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Your Child's Future is in Your Hands (1978)	0.50
Health Hazards of Mycotoxinx in India (1978)	5.00
Lathyrism - A Preventable Paralysis	0.50
Prevention of Blindness	0.25
Japanese Encephalitis in India, Revised Edition 1980	5.00

These publications are available on prepayment of cost by cheque or postal order drawn in favour of the Director-General, Indian Council of Medical Research, New Delhi. Money orders are not acceptable. All correspondence in this regard should be addressed to the Chief, Division of Publication and Information, Indian Council of Medical Research, Post Box 4508, Ansari Nagar, New Delhi-110029.

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VIRUS RESEARCH (1979-80)

Survey of arboviruses and their vectors as well as investigation of outbreaks of viral diseases in different parts of the country were continued by the Council's National Institute of Virology (NIV), Pune. Attempts have been made by NIV to study the natural cycle of many of these viruses in order that effective control measures could be instituted.

JAPANESE ENCEPHALITIS

Investigations of outbreaks:

The National Institute of Virology, Pune, continued investigations of epidemic in various states. During the last quarter of 1979, an outbreak of encephalitis in children occurred in several districts of Karnataka state. Starting during the first week of October, the outbreak reached a peak in the second week of November. The last case was recorded in the third week of December. The adjoining states of Andhra Pradesh and Tamil Nadu also had epidemics of encephalitis. Cases of encephalitis were also reported during the year from the districts of Burdwan, Hooghly and West Dinajpur in West Bengal. However, during 1979, no reports of Japanese encephalitis (JE) were received from Uttar Pradesh.

Studies on the samples collected during the epidemics in 1978 at Asansol, Dhanbad, Kolar, Tirunelveli, Gorakhpur and Basti were continued. Analysis of data obtained on the human specimens from Dhanbad and Asansol showed that around 20 per cent of the patients who were found to be serologically negative for JE (or other flaviviruses) exhibited a clinical picture indistinguishable from those serologically confirmed to be JE. The aetiology of these cases remains undetermined.

Studies on specimens received from different parts of the country:

Human specimens:

Serological confirmation of JE viruses aetiology in three of the eight patients of encephalitis from Kolhapur district was obtained. This is the first serologically confirmed report from Maharashtra state.

Animal sera:

Because of the known association of pigs with JE, a large number of pigs were destroyed by the public health authorities in Andhra Pradesh. Sera collected from 151 pigs from Hyderabad city just before their slaughter were tested. Flavivirus antibodies were detected in about 35 per cent of the sera. HI antibody titres to JE virus (64.6) were found to be significantly higher than that to WN virus (17.3). These sera were, however, from young piglets and the antibodies were 2-ME resistant which suggested that they were maternal antibodies. On the other hand, the HI tests on 53 cattle and goat sera from Kolhapur and Nagpur (Maharashtra) indicated that the geometric mean HI antibody titre to

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WN virus (20) was significantly higher as compared to JE virus (10). Investigations in Tirunelvelli district (Tamil Nadu) indicated a high prevalence of JE virus infection among domestic animals, particularly donkeys and pigs.

Immunoglobulin E (IgE) in patients of JE:

IgE values were determined in (i) acute and convalescent paired sera of 29 patients of encephalitis, 25 of whom were serologically confirmed to be JE; (ii) single acute-phase sera of 22 fatal cases of encephalitis; and (iii) 19 sera of the 'controls'. Significantly higher levels of IgE were noted in the acute-phase sera either from the fatal cases or the survivors, as compared to the sera of controls or convalescents. The results indicated a rise in IgE levels during the acute phase of JE. There was a rapid decline in IgE values in the convalescent phase sera which might be a result of sequestration at local tissue sites or due to the high rate of catabolism of IgE.

Polypeptides of Sindbis and JE viruses:

Preliminary experiments with purified dissociated Sindbis and JE virus proteins are being carried out by electro-focussing in gel techniques.

JE vaccine:

Mouse challenge potency tests were carried out according to the standard procedures with vaccine imported from Japan. It was found that the vaccine was on the borderline of acceptability when the vaccinated mice were challenged either with the Nakayama strain of JE or with the recently isolated Indian strain.

Studies on laboratory personnel:

One hundred and ten staff members of the NIV, Pune, were administered two doses of inactivated mouse brain JE vaccine, with an interval of 7 to 15 days between the two doses. Pre-vaccination and post-vaccination serum samples were obtained three weeks after the second dose. These sera were tested for HI antibodies to JE, WN and DEN-2 viruses and for neutralizing (N) antibodies to JE virus. The results indicated that the vaccine was effective at least in 33.3 per cent of vaccinees, as judged by the N antibody response. In addition, vaccinees with N antibody to JE virus in pre-vaccination sera also showed a significant rise in the titres of HI antibodies.

Field studies:

In collaboration with the Government of Assam, a small vaccine trial was carried out in the Dibrugarh district of Assam. Two doses of JE vaccine were administered (*sc*) at an interval of 15 days. Blood was collected just prior to the first dose and one month after the second dose of the vaccine. Only about 10 per cent of the vaccinees showed the development of demonstrable antibodies. These results thus give rise to doubts regarding the effectiveness of the killed JE vaccine, more particularly under field conditions.

Live attenuated JE vaccine:

It has been reported earlier that three strains of JE virus were obtained in the laboratory which were of low pathogenicity to mice. Viraemia studies with one of these strains have been carried out in one day-old chicks and it was found that as compared to the wild strain, viraemia was significantly lower with the attenuated strain. N antibodies were detected in the sera of these chicks. The three attenuated and the wild strains were inoculated (*ip*) in almost equivalent doses (3.3-3.5 dex) into different groups of baby mice. The virus in mouse brains was assayed on different post-infection days. The attenuated strain 724038 (CHK 31) did not show a detectable growth. The other two attenuated strains (2829-2 and 3826-2) demonstrated some growth but markedly less than the wild strain.

Weanling mice were inoculated by the intracerebral route with the attenuated strain (724038) of JE virus. No mortality was observed in mice inoculated even with the lowest dilution. When these mice were further challenged intracerebrally with the wild strain of JE virus, considerable protection was observed. The mice inoculated with the attenuated strain of JE virus showed neutralizing antibodies.

Immune cell transfer to JE infected mice:

Immune cell transfer studies on JE virus infected mice were continued. It was found that there was a marked reduction in necrosis and in virus titre in the brain when immune cells were transferred to the JE virus infected mice. When homing of the mouse immune

cells in the JE virus infected and control mice was studied, no significant difference was found between the two. This suggests that there is some humoral mechanism which protects the brain cells.

WEST NILE (WN) VIRUS

WN virus is prevalent in many parts of India. Although several strains of WN virus have been recovered from mosquitoes, so far it has been isolated only once from a patient with KFD-like illness. WN virus has a close relationship with the JE virus and thus serological overlap is common. An occasional case of encephalitis has been associated with WN virus infection on serological evidence.

In 1978, a localised outbreak of encephalitis-like illness occurred at Palehalli village in the Mandya district of Karnataka state. Tests on single serum specimens indicated recent activity of some flavivirus, most likely of JE-WN complex. In 1979, 21 of the residents whose blood samples had been collected earlier during 1978, were again re-bled. Serological tests indicated that at least two of these patients had encephalitis-like illness due to WN virus infection. Seroconversion for WN virus was also obtained in two patients of encephalitis from southern Maharashtra.

KYASANUR FOREST DISEASE (KFD)

The southern and eastern focus of KFD epizootic/epidemic activity in Aramanakoppa area in Hosanagar taluk of Shimoga district in Karnataka was active as evidenced by monkey deaths and human cases. The northern focus, however, remained inactive and only two human cases were reported from the western subfoci. A total of 153 human cases - all fatal - were proved to be due to KFD virus. Studies on the prevalence of various species of ticks in relation to changes in ecology have been continued. The mosquito fauna in the KFD area are also being studied.

DENGUE

Outbreak of febrile illness at Rahuri (Maharashtra):

An outbreak of dengue-like illness was investigated at Rahuri at about the end of November 1979. Virological/serological investigations showed that the illness was due to dengue virus. The serological pattern indicated 'secondary' dengue type of response in many cases. However, no serious haemorrhagic manifestations were noted.

Surveillance of dengue at Bangalore:

Surveillance of dengue activity in Bangalore city was continued during the year and two strains of virus were isolated - one from a case of pyrexia of unknown origin and another from a pool of *Ae. aegypti* mosquitoes.

Aedes aegypti in rural areas:

An interesting finding during the year was the detection of *Ae. aegypti* in 4 villages - Gadashahalli and Aralalu in Kanakapur taluk of Bangalore district, Valageredoddy in Malavalli taluk of Mandya district and Jalahalli in T. Narasipura taluk of Mysore district. Both adults and larvae were obtained in all these four villages. A strain of dengue virus has been isolated in mice from 20 *Ae. aegypti* collected in Jalahalli village.

PHLEBOTOMUS FEVER VIRUSES

Breeder mice of various strains were immunized against the Naples type of phlebotomus fever virus by the *ip* route. Babies born of such immunised mother rats were challenged by the intracerebral route with phlebotomus fever virus and other arboviruses. The NIV strain of mice withstood the challenge of Naples virus to the extent of 2.5 dex LD_{50} but in the C-15 and LP strains of mice, protection to challenge was of a lower order. No protection to heterologous viruses, *viz.* Chandipura and dengue viruses, was observed. Attempts were made to produce haemagglutinins from the infected organs of mice by treatment with protamine sulphate. Haemagglutinating antigen was obtained from brains of mice harvested on the 7th day and from the liver on the 6th day after inoculation. However, these antigens were unstable on desiccation and storage. Tests for susceptibility of golden hamsters to phlebotomus fever virus indicated that the liver is the target organ.

PYREXIAS OF UNKNOWN ORIGIN

Nearly 221 paired serum samples from cases of pyrexia of unknown origin (PUO), most of them from Pune, were tested for CF antibodies to several flaviviruses, *viz.* JE, WN and all the 4 dengue types. Most of these specimens had been collected in previous years but not adequately tested. Conversion from negative to positive for one or more flavi-

viruses, or significant rises in CF antibody titre to these viruses were detected in 93 cases (42.1 per cent). The findings indicate the important role of flaviviruses, particularly dengue, in the aetiology of PUO in Pune.

INTERACTION OF VIRUSES AND PARASITES

Experimental dual infection in mice with Toxocara canis and Wanowrie virus:

Earlier, a synergistic effect of dual infection of mice with *Toxocara canis* and JE virus was reported. Since JE virus has a greater predilection for the brain, studies were carried out using *T. canis* and Wanowrie virus, which produce systemic lesions in mice. No sickness was noticed in the dually infected mice, although a much higher rate of isolation of the virus was obtained from the brains of these mice as compared to those infected with the virus alone.

Plasmodium gallinaceum and JE virus infection in Aedes aegypti:

Initially, an experiment was carried out to see if JE virus could multiply and be transmitted by *Ae. aegypti* mosquitoes. It was shown that this predominantly urban mosquito is capable of transmitting JE virus experimentally in chicks. The effect of simultaneous infection with *P. gallinaceum* and JE virus in *Ae. aegypti* mosquitoes was therefore studied. Results in the dually infected mosquitoes showed a distinct antagonistic effect of the parasite on the JE virus infection.

HEPATITIS

Retrospective serological tests:

Outbreaks of hepatitis in Delhi (1956) and Ahmedabad (1976) had been established to be water-borne and of viral origin. Tests for hepatitis B virus (HBV) carried out earlier had shown only a small proportion to be positive and it was concluded that majority must have suffered from hepatitis A virus (HAV).

Tests for HAv with some of the paired sera carried out in 1979 at the National Institutes of Health, Bethesda, USA, failed to incriminate HAV as the aetiological agent. It appears that epidemics of hepatitis with epidemiological characters of HAV might be caused by an agent other than HAV or HBV - probably by non-A, non-B viral agent(s).

Hepatitis in pregnancy:

Sera from 50 women hospitalised for hepatitis in pregnancy were tested for evidence of infection with hepatitis B virus by the RIA technique. HBsAg was detected in six of these patients (12 per cent) and three (6 per cent) had antibodies to hepatitis B surface antigen (anti-HBs). Two of the six fatal cases also had HBsAg in their sera. Clinically normal, age and parity matched pregnant women were also studied as controls for the prevalence of HBsAg and anti-HBs by the same technique. HBsAg was detected in 6 per cent and anti-HBs in 12.7 per cent of the control group.

Familial infection with hepatitis B virus:

Twelve families in Pune (9 with index patients of hepatitis B and 3 with carriers of HBsAg) were studied to estimate the risk of transmission to other members of the family. Among the families with hepatitis patients, a higher risk of antigenemia was recorded in males as compared to females. On the other hand, a much larger number of females had anti-HBsAg. No such sex difference was seen among the members of households of the 3 HBsAg carriers.

Analysis of hospital records for hepatitis:

A survey of the past five years records of adult cases of infectious hepatitis, gastroenteritis and enteric fever was carried out in order to obtain some leads for future investigations. Statistical analysis of the records of 3782 cases showed a seasonal distribution with preponderance during the monsoon period in all the three diseases. The peak for hepatitis was observed a little later than for gastroenteritis and enteric fever. However, no seasonal pattern was noted in the fatal cases of the three groups. In all the 5 years, males outnumbered females in the three groups. The analysis showed however, a distinct trend in recent years of more females seeking admission to the hospital. In the hepatitis group, the case fatality rate (CFR) was 3.3 per cent in 991 cases, excluding pregnant women. The CFR for pregnant women was 13.6 per cent which suggested a higher risk in pregnancy. Even without pregnancy, the risk was at least twice as high (5.8 per cent) in females as compared to males (2.5 per cent).

INFLUENZA

An outbreak of respiratory illness at Pune, resembling influenza was investigated

during the year. Thirty one haemagglutinating agents were isolated from these cases. Six were identified as H1N1 subtype similar to A/Brazil/11/78; one each as H1N1 subtype similar to A/USSR/90/77 and B/Hong Kong/5/72. Tests on the sera collected during an outbreak of influenza in 1978 at Pune were continued. Of the 129 paired serum samples, 33 per cent showed seroconversion to A/Pune/1/76 (H3N2) which is similar to A/Victoria/3/75 and 37 per cent to A/Pune/2/78 (H1N1) which is similar to A/USSR/90/77.

A total of 82 animal sera collected in earlier years were tested for HI antibodies to 9 antigens. It was found that sera of ducks and bats showed significantly higher antibody titres as compared to those of other species, *viz.* pig, fowl and egret.

Studies are also in progress at the Central Research Institute, Kasauli, on the isolation of influenza viruses from birds and animals.

POLIOMYELITIS

The Council's Enterovirus Unit, Bombay, continued its studies on poliomyelitis surveillance, virological studies in paralytic poliomyelitis, efficacy of monovalent oral polio vaccine, immune response to live viral vaccines, potency of oral polio vaccine used in the field, stability of oral polio vaccine at -20°C, enterovirus prevalence in the healthy child population, role of non-polioviruses in cardiovascular pathology, anti-poliovirus activity in human saliva and preparation of antisera.

Immune response to live measles and oral polio vaccines:

The results of a study conducted at the Enterovirus Unit, Bombay, clearly show that children who do not have pre-existing antibodies to measles virus respond extremely well to a single dose of live measles vaccine, while in those who possess antibodies to measles virus either because of subclinical infection or classical disease, the vaccine evokes a very poor response *i.e.*, the booster effect of the live measles vaccine is very poor.

Estimation of polio antibodies in the vaccinees is in progress.

Anti-poliovirus activity in human saliva:

In an attempt to improve the efficacy of oral polio vaccine, the possible role of inhibitors existing in physiological secretions is being studied by the Enterovirus Unit, Bombay. Studies on human milk and faeces have been reported earlier. Attempts are being made to detect inhibitors in human saliva. So far, 25 samples of human saliva from prospective vaccinees (children), have been studied. No inhibitors with respect to any of the three types of poliovirus have been detected in these samples. Studies are being continued.

COXSACKIE VIRUSES

Acute rheumatic carditis of streptococcal aetiology is generally considered to be the sole cause of chronic valvular heart disease (CVHD). However, many patients with CVHD do not have a history of rheumatic fever. In many parts of the world, the prevalence of acute rheumatism and consequent CVHD have declined, but the prevalence of CVHD without precedent rheumatism has not declined. This and other similar reports led to the concept of non-rheumatic CVHD. However, there has been inadequate search for other aetiological factors. Since group B Coxsackie viruses (CBV) are cardiotropic, causing myocarditis, endocarditis and valvulitis, an attempt was made to evaluate evidence of preceding CBV infection in patients with CVHD. Sera from 29 patients with CVHD and 58 age matched controls were collected and titres of neutralizing antibodies to the 6 serotypes of CBV were determined. There were highly significant differences between patients and controls in the titres of antibodies to CBV types 3 and 4 and in the prevalence of antibody to type 3. There were no significant differences between the antibody titres of the two groups to CBV types 1, 2, 5 or 6. Based on these results, and in view of the cardiotropism of these agents, it is postulated that CBV types 3 and 4 have an aetiological role in the pathogenesis of chronic valvular heart disease, at present commonly believed to be exclusively due to rheumatic (streptococcal) aetiology. Studies on the role of non-polio enteroviruses in cardiovascular pathology are also in progress at the Enterovirus Unit, Bombay.

ROTAVIRUS

Rotavirus infection in neonates:

Faecal samples were collected daily from 21 neonates and tested for the presence of rotavirus by counter-immunoelectrophoresis, using antisera raised against Nebraska calf

diarrhoea virus and simian rotavirus. Fourteen neonates were found to excrete rotavirus. It was detected in the stools of 7 of 11 neonates with transient diarrhoea. No diarrhoea occurred in the rest (7) of the infected neonates. Four of the 7 uninfected neonates also had transient diarrhoea. Thus, rotavirus infection and transient diarrhoea were found to be common among neonates, but it appeared that they were unrelated to each other.

Rotavirus diarrhoea in children in Manipur:

Recurrent epidemics of acute gastroenteritis in children, mostly under 2 years of age, have been reported from the state of Manipur. The epidemic which occurred in the winter of 1979 was investigated by the National Institute of Cholera and Enteric Diseases, Calcutta.

Of 481 cases admitted, 93.3 per cent were below 2 years of age. Fifty four (91.5 per cent) of the 59 cases sampled by the team were found positive for rotavirus by ELISA technique. Enteropathogenic *E. coli* were isolated from 7 stool samples which were also positive for rotavirus. The recurrent epidemics of winter diarrhoea in children in Manipur are perhaps caused by rotavirus.

VIRAL PNEUMONIAS

Twenty eight patients with radiological evidence of a pneumonic patch were studied between January and May 1979. Twelve paired sera, 4 single acute-phase sera and 12 single convalescent-phase sera were tested for complement fixing (CF) antibodies to parainfluenza types 1, 2 and 3 viruses, influenza type A virus, influenza type B virus, adenovirus, respiratory syncytial virus, *Mycoplasma pneumoniae* and *Coxiella burneti*. A diagnosis could be made in 8 of the 28 cases (28.6 per cent).

IMMUNOLOGICAL STUDIES

Guillain-Barre syndrome and transverse myelitis:

Investigations of cases of Guillain-Barre Syndrome (GBS) admitted to the Sassoon Hospital and Ruby Hall Clinic, Pune, were continued. CSF IgG/albumin ratio was determined in GBS and transverse myelitis cases and compared with that of JE cases from Gorakhpur district (UP). Immunoglobulins and albumin in CSF were markedly increased in GBS patients as compared to other neurological cases. CSF IgG/albumin ratios in GBS and JE were within normal limits which indicates the possibility of damage to blood-CSF barrier. These ratios were high in some of the cases of transverse myelitis indicating a local production of IgG.

Enzyme linked immunosorbent assay:

Twenty four CSF samples collected from JE cases were tested for antibodies to JE/WN viruses by the ELISA technique. Eight were found positive, five with JE virus and three with WN virus only. The specificity was confirmed by N test.

Sequential immunization with flaviviruses:

Studies on sequential immunization with four flaviviruses (JE, WN, DEN-2 and KFD) using four different schedules were carried out in rabbits with a view to find out a suitable sequence of immunization in India. All the four viruses selected for immunization are prevalent in the country and three of them *viz.* JE, DEN and KFD are of public health importance. Immune complexes and persistent fraction (infectious virus and antibody complex) were found to be higher whenever there was a high titre of HI and CF antibodies and a low titre of N antibodies. In these experiments, broad spectrum cross-reactive protective N antibodies were produced after three doses of viruses in all the four sequences. In the light of this experience, a suitable sequence of immunization seems to be JE, DEN-2 and WN. However, in an area where the human population is sensitive for DSS/DHF it is advisable to give dengue vaccine either as the first or the third dose, instead of as the second dose. In KFD endemic area, KFD, JE and DEN-2 sequence of immunization may be carried out to induce protective immunity.

TISSUE CULTURE

Arthropod tissue culture:

Studies have been initiated to make cell cultures from the mosquito *C.bitaeniorhynchus*. Preliminary experiments have been successful. A cell line from *Ae. albopictus* and ATC-15 have been adapted to lower the concentration of foetal bovine serum. Efforts are now being made to maintain these and *Ae. novalbus* cells in the absence of serum.

Tumorogenicity of mosquito cell lines:

Tumorogenicity of *Ae. aegypti* (ATC-10) *Ae. albopictus* (ATC-15) and *Ae. vittatus* (ATC-

121) cell lines was studied by inoculating the cells in the cheek pouch of conditioned hamsters, thymectomised new born mice, chorioallantoic membrane (CAM) of chick embryo and adult mosquitoes. ATC-10 and ATC-15 cells inoculated in the CAM exhibited vascularisation round the site of inoculation with a mass of cells. Most of the histopathological sections revealed penetration of these cells in the mesodermal layer. However, these cells and ATC-121 cells did not produce tumour in all the other systems studied.

Replication of Togaviruses:

Experiments are in progress for determination of the requirement of different amino acids for the multiplication of Togaviruses. The studies show that if glutamine, cystine, arginine and histidine are deleted from the medium, then the growth of Sindbis and WN viruses is suppressed. It was also observed that the virus-suppressing effect of amino acid deprivation is reversible. On the other hand, deletion of isoleucine, leucine and methionine from the media did not suppress the virus growth.

Sindbis and WN viruses seem to have different amino acid requirements for their growth which may be reflected as a difference in the maturation process of the alpha and flaviviruses.

ENTOMOLOGICAL STUDIES

Taxonomy and laboratory rearing of mosquitoes:

Studies on *C. bitaeniorhynchus* complex were undertaken to find out the taxonomical status of different members of this complex. It appears that this complex probably consists of three species *viz. C. bitaeniorhynchus* type form, *infula* and *ambiguus*. These species have been successfully colonised in the laboratory and further studies on their vectorial potential for JE virus are in progress. Similar studies on *A. hyrcanus* group in India are also being carried out.

Ecology of mosquitoes in the coastal area:

Studies on the mosquitoes in a selected area near Panvel, Maharashtra, were initiated during the year. This area was selected for studying the mosquito fauna in an area where no cases of JE have occurred. So far, a total of 8,530 adult mosquitoes comprising 25 species have been encountered. In the adult collection, *A. trimaculatus*, which has been collected rarely in the past, has been collected in large numbers. Description of the larvae and pupae of this species is in progress.

Flight behaviour of mosquitoes:

Laboratory studies on the flight behaviour of mosquitoes have been initiated. For this purpose, a mosquito flight mill has been fabricated at NIV, Pune. The 1 to 6 days-old laboratory reared *Ae. aegypti* mosquitoes showed progressive increase in the duration of flight with advance in age. There was a considerable weight loss of mosquitoes after flight. Studies on the behaviour of normal and virus-infected mosquitoes are in progress.

Protozoan parasites of mosquitoes:

A survey of protozoan parasites of mosquitoes around Pune has been undertaken. A total of 831 adults and 80 larvae comprising 36 species were dissected. Of these, *Ae. albopictus* (132/196 adults and 4/6 larvae), *Ae. aegypti* (6/74 larvae) and *Armigeres subalbatus* (27/115 adults) were positive for *Lankesteria* parasites and three strains of the parasite have been isolated. Experimental studies have been initiated to determine the host range of this parasite for different species of mosquitoes. Their susceptibility to infection with arboviruses and the possibility of transovarial transmission in dually infected mosquitoes will also be studied. Preliminary experiments have shown that the presence of *Lankesteria* species did not have any effect on the susceptibility of *Ae. albopictus* to chikungunya virus nor did it transmit the virus transovarially.

Sandflies:

A survey of sandflies was carried out in Jammu and Kashmir in 1977. They were identified as *Sergentomyia babu, S. baghdadis, S. clydei, S. kauli, S. montana* and *S. squamipleuris indica*. The sandflies collected from Dhanbad district (Bihar) in July 1978 were also identified. The species in the order of numerical abundance, were *Phlebotomus argentipes, S. babu, P. papatasi, S. zeylanica, S. punjabensis* and *S. bailyi*.

Bionomics of hyalomma ticks:

Heavy infestation of some cattle sheds with *Hyalomma a. anatolicum* has been discovered in the districts of Aurangabad, Ahmednagar and Pune. A large proportion of fed nymphs collected in these cattle sheds were

found infested with a chalcid parasite belonging to the genus *Hunterellus*. Studies to determine the exact identity of this chalcid are being conducted. Another chalcid, *Hunterellus sagarnesis* was found infesting *Haemaphysalis bispinosa* in certain cattle sheds in Manjri, near Pune. Both these chalcids are host-specific parasites and are being studied further.

JALMA TRUST FUND AWARD (1979) ORATION

Dr. G.P. Talwar, Professor and Head, Department of Biochemistry, All India Institute of Medical Sciences, New Delhi, delivered the Jalma Trust Fund Award (1979) Oration on Implications of Immunological Research on Control of Leprosy at the Indian Council of Medical Research, New Delhi, on January 15, 1981.

Leprosy is a maladie of concern to the country. The estimated number of patients has increased over the last 30 years from 1.5 million in 1952 to 3.2 million in 1971 and beyond 4 million in 1980, in spite of the extensive State and Voluntary Agencies control programmes. The area of endemicity has spread, with fair number of cases being detected during a recent survey in a district of Rajasthan, a State hitherto considered largely free of this disease.

Man is the principal reservoir of infection and unless strategies are developed to prevent the growth and transmission of bacteria to others in the community, it will be difficult to control the disease. The present programmes based on treatment of cases when they are already 'committed' patients may not alone provide an effective deterrent to the spread of the disease. Leprosy has a long incubation period, during which carriers of infection go undetected and pose potential hazard to others.

With the powerful techniques of modern protein chemistry, it should be possible to isolate the proteins unique to *M. leprae*. The fact that they exist and are antigenic is indicated by the presence of antibodies in the sera of leprosy patients which react specifically with *M. leprae*. Feasibility of their identification and isolation is suggested by the methods employed successfully in the laboratory at the All India Institute of Medical Sciences (AIIMS), New Delhi, to demarcate the proteins unique to *Mycobacterium tuberculosis* $H_{37}Rv$ as distinct from BCG and other mycobacteria. Extension of this methodology to *M. leprae* to obtain *M. leprae* specific marker proteins, as well as by developing monoclonal hybridoma antibodies to these markers can enable the development of low cost simple immunodiagnostic kits to identify the 'carriers' and multipliers of infection in the apparently healthy population. In patients under treatment, these kits can identify the 'persisters'.

A notable feature of leprosy is the fact that most of those exposed to infection (95 per cent) can resist the disease. The important role of host immunity is also evident from the clinical forms in which the disease manifests. A major part of the researches at the AIIMS have been directed to learn more about the nature of the defect in the immune apparatus in lepromatous leprosy (LL). LL patients have high immunoglobulins and respond with normal or better titres to booster vaccination with TAB. The cell mediated immune functions are however depressed. Immunosuppression is of two types; the reversible component of general depression bears relationship with the bacillary load and is in all likelihood a secondary consequence of infection. There is however a long-term anergy of response to *M. leprae* antigens in polar and subpolar LL cases. The lymphocytes transform poorly to these antigens, and do not generate the polypetides (lymphokines) that influence macrophages and other cells. The central failure in LL cases is in the function of the phagocytic cell, the macrophage, which is unable to inhibit bacillary growth and eliminate the mycobacteria. Experimental evidence points to the lack of appropriate interaction between the lymphocyte and the macrophage.

Can this defect be corrected, and can the deficient host immunity be invigorated by some approach? Attempts are being made by investigators in India and other parts of the world to develop vaccines against leprosy. The current status of this research was critically reviewed alongwith the work carried out in the AIIMS laboratory.

Immunopotentiation is a boon for prophylaxis. It is however contraindicated in patients loaded with bacilli, where new strategies for selective immunosuppression

need to be evolved to prevent nerve damage. Recent researches emphasize the importance of immunological reactions in pathogenesis of peripheral nerve damage.

SUMMARY OF LECTURE DELIVERED AT THE ICMR, NEW DELHI

Studies on Nutritional Anaemia by Dr. S. Swarup-Mitra, Assistant Director, ICMR Haematology Unit, School of Tropical Medicine, Calcutta, on January 29, 1981.

Anaemia due to deficiency of haemopoietic nutrients is responsible for a high rate of morbidity in Indian population. Of the various nutrients responsible for orderly haemopoiesis iron, folate and vitamin B_{12} are important. Surveys carried out in India have shown that about 50 per cent of children are anaemic. In one such survey in the slum areas in Calcutta 900 subjects were investigated and 80 per cent women, 60 per cent children and 48 per cent men had haemoglobin levels below 10 g/dl; the overall incidence of anaemia was 57 per cent. If the WHO standard i.e. 12 g/dl as the normal value for haemoglobin is employed, the incidence of anaemia will be still higher. Response to oral iron therapy showed that anaemia in the majority of subjects is due to deficiency of iron.

Iron deficiency (ID) as the cause of anaemia is well recognised. However, anaemia is a late feature in the evolution of ID state. In the earlier stages symptoms may occur in the absence of anaemia. Tissue changes *i.e.* thinning of nails, glossitis and stomatitis are well recognised. The less known tissue changes encountered in 150 ID anaemia patients were enlargement of spleen (7.4 per cent), liver (25 per cent) and parotid glands (3.0 per cent) and eye changes in some cases. Relief of symptoms before any change in haemoglobin level following iron therapy indicates role of iron in maintaining tissue health.

Studies on the activity of the enzymes catalase, aconitase and succinic dehydrogenase in blood before oral iron therapy revealed that in a proportion of cases the activity of these enzymes was depressed. The activity of catalase ran parallel to the haemoglobin level while activity of aconitase and succinic dehydrogenase depended on the serum iron levels, lower enzyme activity being recorded when serum iron was low.

Evaluation of the activity of aconitase and succinic dehydrogenase in different fractions of blood indicated that there was no difference in the activity of these enzymes in the red cells of ID and normal subjects while the enzyme activity of buffy coat, containing leucocytes and platelets, was low in ID, being 1/5 to 1/10 of the activity recorded in normal subjects. No activity was detected in plasma. In the blood of patients suffering from nutritional macrocytic anaemia due to folate deficiency and with normal or elevated values for serum iron, enzyme activity was not much affected. Thus deficiency of iron has an adverse effect on the leucocytic metabolism. Activity of these enzymes in ID subjects usually became normal following normalisation of haematological values in response to oral iron therapy.

Estimation of the activity of enzymes aconitase, succinic dehydrogenase and cytochrome C oxidase as well as the level of cytochrome C in bone marrow and skin showed that in bone marrow, activity of aconitase and succinic dehydrogenase was low while in skin all the enzymes were depressed in a proportion of cases. In both the tissues recovery of the enzyme activity occurred a long time after normalisation of haematological indices. Hence continuation of therapy was considered necessary even after the haematological values had attained normal levels.

In view of the effect of ID on the leucocytes, its effect on the function of leucocytes in immune mechanism was investigated. A few cases of folate deficiency were also studied.

The cell mediated immune response (CMI), the humoral immune response and function of neutrophils were investigated together with matched normal controls. While in the adult ID patients both types of T cells (early acting and late acting) were depressed, in children there was a depression of total lymphocyte count in addition to that of CMI. The function of T lymphocytes as judged by ^3H thymidine incorporation in DNA and delayed hypersensitivity was depressed in all cases. The humoral immune response was not significantly altered in majority of patients. While the phagocytic capacity of polymorphonuclear neutrophils (PMN) was not much altered, there was a marked depression in the bactericidal capacity of PMNs which was

related to serum iron level provided serum iron level was below 30 ug/dl. Above that value no correlation between serum iron and the bactericidal capacity of PMNs could be found. The function of T lymphocytes and PMN became normal following oral iron therapy in majority of the patients.

In folate deficiency the decrease in number of T cells was less marked than in ID patients. The function of T lymphocytes as judged by ^{3}H thymidine incorporation in DNA was depressed and this improved following therapy. The data for delayed hypersensitivity test, however, showed normal values. The PMN function was also normal.

It, therefore, appears that anaemia is only one of the many changes brought about by deficiency of iron, the others being changes in tissue metabolism and alterations in the defence mechanism of the ID subject.

ICMR NEWS

Task Force/Expert Group Meetings:

The following Task Forces/Expert Groups met during the month:

ICMR Task Force on Epidemiological Studies on Ocular Disorders of Immediate National Importance.	February 16, 1981
ICMR Expert Group to discuss proposals for the training of hospital administrators, ophthalmic assistants and primary health workers.	February 17, 1981
Study Group of the ICMR Task Force on Indigenous Plant Products for Fertility Control.	February 19, 1981
Joint meeting of ICMR and WHO Task Forces on Psycho-social Research in Family Planning.	February 21, 1981
Joint meeting of ICMR and WHO Task Forces on Induced Abortion.	February 23, 1981
Steering Committee of the WHO Task Force on Sequelae of Induced Abortion.	February 24-25, 1981
ICMR Expert Group on Leprosy.	February 24, 1981
ICMR Expert Group on Indo-Peru Collaborative Research on Problems of High Altitude	February 28, 1981

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Joint ICMR and WHO Workshop on Psychosocial Research in Family Planning.	February 19-20, 1981
Joint ICMR and WHO Workshop on Recent Advances in Induced Abortion Research.	February 26, 1981

Seminar/Symposium/Conferences:

Dr. V. Ramalingaswami, Director-General, ICMR, participated in a meeting of the WHO SEA/ACMR sub-committee on Research Needs for Health for All by 2000 AD, held at New Delhi, between February 5-8, 1981. He also participated in the Nutrition sub-committee meeting held on February 26-27, 1981.

Dr. V. Ramalingaswami inaugurated an international symposium on *M. leprae* organised by the Association of Microbiologists of India at Bombay on February 5, 1981.

Dr. M.C. Swaminathan, Deputy Director, National Institute of Nutrition, Hyderabad, participated in a WHO workshop on Nutrition Monitoring and Evaluation held at New Delhi, between February 17-21, 1981.

Dr.G.V.Satyavati,Deputy Director-General, ICMR, inaugurated the VII Southern Regional Conference of the Indian Pharmacology Society at Madurai on February 21, 1981.

ICMR AIDED SYMPOSIA/SEMINARS/WORKSHOPS/CONFERENCES

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
Workshop on Streptococcal Bacteriology and Immunology.	February, 1981	Department of Microbiology, Christian Medical College and Hospital, Vellore.
COGENE Course on Recombinant DNA Techniques.	February 2-22, 1981	Department of Biochemistry, Institute of Medical Sciences, Banaras Hindu University, Varanasi.
National Seminar on Infections of Central Nervous System.	February 10-12, 1981	All India Institute of Medical Sciences, New Delhi (National Academy of Medical Sciences).
Conference on Fifty Years of Electron Microscopy.	February 16-18, 1981	Indian Institute of Science, Bangalore (Electron Microscope Society of India).
Symposium on Chemotherapy and Immunology in the Control of Malaria, Filariasis and Leishmaniasis.	February 18-21, 1981	Central Drug Research Institute, Lucknow.
National Conference on Current Trends in Physical Medicine and Rehabilitation.	February 19-21, 1981	Medical College, Trivandrum (Indian Association of Physical Medicine and Rehabilitation).
National Seminar on Medical Negligence and Symposium on Medicolegal Aspects of Rape.	February 21-23, 1981	Gandhi Medical College, Hyderabad (Indian Academy of Forensic Medicine).
Symposium on Primary Health Care - World Strategy.	February 23-26, 1981	All India Institute of Hygiene & Public Health, Calcutta (World Federation of Public Health Associations).
Symposium on Recent Advances in Hormonal Contraception.	February 24, 1981	All India Institute of Medical Sciences, New Delhi (Association of Obstetricians & Gynaecologists of Delhi).
Symposium on Cancer Chemotherapy.	February 27-28, 1981	KG Medical College, Lucknow (Indian Association of Cancer Chemotherapists).

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
Seminar on Primary Health Care-World Implementation Experiences.	February 28 - March 2, 1981	Institute of Medical Sciences, Banaras Hindu University, Varanasi.
Workshop on Techniques Employed in Light Microscopic Studies for Biology Teachers.	March, 1981	Department of Anatomy, Postgraduate Institute of Basic Medical Sciences, Madras.
Workshop on Standardised Analysis of Diagnostic and Socio-demographic Data at the National Level.	March, 1981	Department of Psychiatry, Postgraduate Institute of Medical Education and Research, Chandigarh (Indian Psychiatric Society).
First National Workshop on Neonatal Surgery.	March 2-7, 1981	Department of Paediatric Surgery, All India Institute of Medical Sciences,
First All India Symposium and Workshop on Anaerobic Infections in Man.	March 14-23, 1981	Department of Microbiology, All India Institute of Medical Sciences, New Delhi.
Workshop in Primary Health Care in Rural Areas with Special Reference to the Nurpur Bedi Pilot Project in Punjab.	March 16-18, 1981	Chandigarh (Institute of Economic Growth, Delhi).
Workshop on Hospital Infections with Special Reference to Gram Negative Bacilli.	March 26- April 1, 1981	Department of Microbiology, All India Institute of Medical Sciences, New Delhi.
Public Health Problems in Desert Environment.	April, 1981	SMS Medical College, Jaipur.
Symposium on Photophysical and Photochemical Process in Chemical and Biological Systems.	April 14-16, 1981	Mahabaleshwar (Indian Photobiology Society).
Guha Research Conference 1981	May 15-20, 1981	University of Kashmir, Srinagar, Kashmir.

PROGRAMME OF SCIENTIFIC LECTURES AT THE INDIAN COUNCIL OF MEDICAL RESEARCH, NEW DELHI

Date	Topic	Speaker
12.2.1981	Clinical and Experimental Manganese Toxicity (Kshanika Oration Award 1979)	Dr.Satyawati Chandra, Lucknow.
5.3.1981	Immunology in Clinical Medicine (Shakuntala Amir Chand Prize 1979)	Dr. A.N. Malaviya, New Delhi.

COUNCIL'S TRAINING PROGRAMMES FOR 1981

Leprosy:

At the Central Jalma Institute for Leprosy, Agra:

Training course in Leprosy for medical officers: (February 15 to March 28, 1981, and August 31 to October 14, 1981).

Virology:

At the National Institute of Virology, Pune:

(1) Diploma course in Medical Virology of Poona University: (July, 1981).

(2) *Workshop on Japanese Encephalitis in India.

Endocrinology:

At the National Institute of Nutrition, Hyderabad:

Annual certificate course in Endocrinological Techniques and their Application: (August to September, 1981).

Nutrition:

At the National Institute of Nutrition, Hyderabad:

(1) Summer School in Health and Nutrition for science teachers from Teachers' Training Institutes: (May/June, 1981).

(2) Annual certificate course in Human Nutrition for teachers from Agricultural Universities: (June/July, 1981).

(3) M.Sc. (Applied Nutrition) course: (June 1, 1981 to February 28, 1982).

(4) Annual certificate course in Public Health Nutrition: (October/November, 1981).

(5) Annual certificate course in Nutrition: (December 1, 1981 to February 28, 1982).

Haematology:

At the Blood Group Reference Centre, Bombay:

(1) A certificate course in Blood Banking Technology and Basic Haematology for medical officers: (February 1 to March 15, 1981).

(2) Training course in Blood Banking Methodology for technicians: (May 12-26, 1981).

Occupational Health:

At the National Institute of Occupational Health, Ahmedabad:

NIOH/WHO Training Course on Air Pollution and Health: (June, 1981).

Clinical Pharmacology:

*At the Department of Pharmacology, Seth G.S. Medical College, Bombay.

Biostatistics:

At the Institute for Research in Medical Statistics, New Delhi:

(1) Certificate course in Planning and Evaluation of Health Programmes: (April, 1981).

(2) Diploma course in Biostatistics: (September, 1981).

(3) Certificate course in Orientation to Biostatistics: (September, 1981).

(4) Certificate course in Statistical Techniques in Medical Research: (January 1982).

Laboratory Animal Technology:

At the National Institute of Nutrition, Hyderabad:

(1) Laboratory Animal Supervisors Training Course: (January 2 to March 31, 1981).

(2) Laboratory Animal Technicians Training Course: (August 1 to September 30, 1981).

COURSES FOR TALENT SEARCH SCHEME FELLOWS

Cell-Biology and Cyto-Genetics:

At the Indian Institute of Science, Bangalore: (March, 1981).

Use of Radioisotopes in Medicine:

At the National Institute of Nutrition, Hyderabad: (July, 1981).

Immunological Techniques:

At the Central Jalma Institute for Leprosy, Agra: (November, 1981).

Haematological Techniques:

*At the Department of Pathology, Christian Medical College, Vellore.

Clinical Endocrinology:

*At the Institute for Research in Reproduction, Bombay.

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* Dates to be announced later.

RESEARCH PROJECTS UNDER ICMR TASK FORCES ON COMMUNICABLE DISEASES

Applications are invited for research grants for projects recommended by the ICMR Task Forces on Communicable Diseases. Reports of the Task Forces will be supplied on request to Institutions and Scientists who wish to undertake research in these areas. Reports of the following ICMR Task Forces are now available:

1. Task Force on Diarrhoeal Diseases
2. Task Force on Intestinal Parasitic Infections
3. Task Force on Sexually Transmitted Diseases
4. Task Force on Acute Respiratory Diseases
5. Task Force on Kala-azar
6. Task Force on Encephalopathy in Children
7. Task Force on Microbiology
8. Task Force on Health Care Delivery Systems
9. Task Force on Viral Hepatitis
10. Task Force on Leprosy
11. Task Force on Filariasis
12. Task Force on National Antibiotic Policy
13. Task Force on Rabies
14. Task Force on Enterovirus (Picorna Virus) Infections
15. Task Force on Tick Borne Diseases in India
16. Task Force on Microbiology of Food
17. Task Force on Assessment of Parameters of Malaria
18. Task Force on Malaria
19. Task Force on Influenza
20. Task Force on Tuberculosis

Enquiries may be addressed to Senior Deputy Director-General, Division of Epidemiology and Communicable Diseases (ECD), Indian Council of Medical Research, Ansari Nagar, New Delhi-110029.

ICMR FELLOWSHIPS

Revision of stipend rates and contingency grants

Sl. No.	Category		Existing Rates		Revised Rates	
			Stipend (P.M.)	Contingencies (P.A.)	Stipend (P.M.)	Contingencies (P.A.)
			(Rs.)	(Rs.)	(Rs.)	(Rs.)
1.	**Junior Fellowship	1st year	400.00		600.00	
		2nd year	450.00	1000.00	650.00	5000.00
		3rd year	500.00		700.00	
2.	**Senior Fellowship	1st year	700.00		800.00	
		2nd year	750.00	1500.00	875.00	7000.00
		3rd year	800.00		950.00	
3.	**Research Associate					
	a) Fresh doctorate	1st year	1000.00		1100.00	
		2nd year	1075.00		1175.00	
		3rd year	1150.00		1250.00	
	b) Doctorate with 1 year experience	1st year	1075.00		1175.00	
		2nd year	1150.00		1250.00	
		3rd year	1225.00		1325.00	
				2000.00		10000.00
	c) Doctorate with 2 years experience	1st year	1150.00		1250.00	
		2nd year	1225.00		1325.00	
		3rd year	1300.00		1400.00	
	d) Doctorate with more than 2 years experience	1st year	1225.00		1325.00	
		2nd year	1300.00		1400.00	
		3rd year	1400.00		1500.00	
4.	*TSS Fellowships	1st year	825.00	-	925.00	-
		2nd year	900.00	-	1000.00	-
		3rd year	975.00	-	1075.00	-

* Rates applicable from 1st February, 1981.

** Rates applicable from 1st March, 1981.

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LONG TERM EFFECTS OF VASECTOMY : HYPOTHALAMO-PITUITARY-GONADAL FUNCTION

There are very few studies on the possible long-term effects following vasectomy, which might become manifest later in life. Gosselin[1] and Shulman *et al*[2] have shown that vasocclusion of many years standing has no deleterious effect on the seminiferous epithelium and the epididymis.

Studies on testosterone levels in vasectomized men are limited to the relatively short post-operative period. Bung[3] measured plasma testosterone in 50 healthy males before and after vasectomy. There were neither individual changes nor alterations in the mean value of plasma testosterone after six months, or one year following vasectomy[4]. Other short-term studies have also emphasized normal endocrine function for periods upto one year following vasectomy[5,6]. Long-term studies show contradictory results. Varma and colleagues[7], and Skegg and associates[8] studied men vasectomized 5 to 6 years earlier and found no statistically significant difference in testosterone as compared to the levels in normal control subjects. In a longitudinal study, Johansonbaugh *et al*[9] observed no changes in testosterone and dihydrotestosterone over a period of 2 to 2.5 years following vasectomy. A two year study by Smith and co-workers[10] showed statistically significant elevations of blood testosterone. However, the mean values did not exceed the normal range found in adult males.

No short term changes in plasma LH and FSH were observed following vasectomy[5,6]. Studies in a group of men, 1 to 5 years post-vasectomy, revealed no significant difference in plasma LH and FSH levels as compared to the controls[7]. In another study a significant elevation in serum LH was recorded in one-third of the vasectomized subjects examined two years post-operatively, however, FSH did not show any such change[11]. Smith and co-workers[10] in a two year study, noted a tendency for LH levels to rise significantly after six months, this persisted at 12 and 24 months post-vasectomy. Johansonbaugh *et al*[9], in a similar study failed to observe any alterations in LH and FSH levels.

In view of these conflicting data, a cross-sectional study was undertaken at the Institute for Research in Reproduction (IRR), Bombay, in 180 vasectomized (1-10 years earlier) men and 36 normal men with proven fertility to evaluate the long-term effects of vasectomy on the serum levels of testosterone, total estrogen, LH and FSH.

The serum estrogen levels remained unaltered in all age groups (Table I) suggesting that vasectomy does not produce alteration in blood levels of estrogen.

Serum levels of testosterone (Table I) in vasectomized and control subjects were not different in the age group 35 and 35-40 years. However, in the age group 41-45 years, a significant elevation in serum testosterone levels was observed. The levels of testosterone in control subjects in this group were lower than

Table I

Serum levels of testosterone, estrogen, LH and FSH in vasectomized men

Age group (years)	Duration after vasectomy (years)	Testosterone mg/ml	Total Estrogen pg/ml	LH mIU/ml	FSH mIU/ml
35	Control	6.15 ± 0.84 (12)	89.56 ± 5.33 (14)	11.21 ± 0.98 (14)	9.85 ± 1.12 (14)
	1 - 2	6.81 ± 0.69 (13)	86.98 ± 7.03 (12)	13.88 ± 2.06 (10)	8.56 ± 1.48 (10)
35 - 40	Control	6.17 ± 0.51 (13)	90.16 ± 5.08 (14)	11.06 ± 1.50 (12)	11.22 ± 1.22 (12)
	1 - 2	6.42 ± 0.51 (19)	83.45 ± 4.09 (16)	14.25 ± 1.98 (15)	6.13 ± 0.85 (14)
	3 - 4	5.59 ± 0.52 (13)	75.30 ± 4.66 (11)	13.92 ± 1.29 (17)	8.41 ± 0.97 (17)
	5 - 6	6.43 ± 1.32 (5)	85.50 ± 5.56 (7)	13.93 ± 1.41 (8)	7.71 ± 1.19 (8)
	7 - 8	6.05 ± 0.43 (20)	88.75 ± 6.31 (13)	15.94 ± 1.99 (20)	7.72 ± 0.85 (19)
	8	6.68 ± 1.31 (4)	77.20 ±16.60 (3)	21.69 ± 4.79 (3)	6.16 ± 3.27 (3)
41 - 45	Control	4.20 ± 0.50 (8)	93.72 ± 6.46 (8)	12.00 ± 1.51 (9)	11.89 ± 2.09 (9)
	1 - 2	6.69 ± 0.79* (9)	88.49 ± 6.46 (8)	19.42 ± 4.21 (9)	12.83 ± 4.05 (9)
	3 - 4	6.09 ± 0.98* (10)	76.11 ±17.91 (4)	12.20 ± 1.93 (10)	7.51 ± 1.35 (10)
	5 - 6	7.08 ± 0.67**(11)	83.25 ± 6.54 (10)	27.78 ± 8.18 (10)	13.02 ± 3.28 (10)
	7 - 8	6.70 ± 0.39**(16)	81.40 ± 4.20 (13)	18.52 ± 2.42 (15)	13.75 ± 3.35 (15)
	8	7.34 ± 0.69**(12)	83.32 ± 5.40 (11)	17.70 ± 1.84 (15)	8.09 ± 0.97 (15)

P<0.05 ** P<0.01

Values expressed as Mean ± S.E.

Figures in parenthesis are number of cases studied.

in other groups. These results indicate that vasectomy does not affect the functioning of the pituitary-gonadal axis.

Serum levels of LH and FSH, as observed in the vasectomized and control subjects in all three age groups, showed no differences (Table I).

Earlier studies in laboratory animals as well as humans, on the function of the accessory reproductive organs revealed inconclusive results. Hence, a cross-sectional study was undertaken in 78 healthy men, in the age group of 35-40 years, vasectomised for a period of 1 to more than 5 years. The control group consisted of 22 normal fertile men of similar age group.

It was observed that seminal plasma constituents such as citric acid,maltase, prolactin, LH, FSH, zinc and magnesium decreased as a result of vasectomy (Table II). No change was observed in the concentrations of fructose, testosterone, sialic acid, protein, calcium, sodium, potassium and acid phosphatase. A significant decrease in glyceryl phosphoryl choline (GPC) and seminal plasma volume was also observed as a result of vasectomy. This decrease in seminal volume could, therefore, be due to decrease in secretory function of either prostate or seminal vesicle or both.

Prostatic secretions are characterised by the presence of high concentrations of citric acid, acid phosphatase, maltase, zinc, calcium, magnesium and prolactin. The seminal vesicular secretions are characterized by the presence of high concentrations of fructose, sialic acid, potassium and protein.

From these investigations in which it was

Table II

Effect of vasectomy on seminal plasma constituents

Constituent		Control	Vasectomised
Fructose	mg/ml	3.49 ± 0.26 (22)	3.36 ± 0.15 (75)
	mg/ejac.	9.43 ± 1.12 (22)	7.31 ± 0.71 (75)
Sialic acid	µM/ml	7.46 ± 0.31 (22)	6.52 ± 0.38 (75)
	µM/ejac.	19.18 ± 1.33 (22)	13.35 ± 0.78* (75)
Protein	mg/ml	68.90 ± 3.73 (22)	65.32 ± 2.48 (75)
	mg/ejac.	180.7 ± 13.52 (22)	144.24 ± 8.33* (75)
Acid phosphatase	mM/ml	205.1 ± 20.7 (22)	192.8 ± 9.9 (78)
	mM/ejac.	576.7 ± 105.1 (22)	391.1 ± 30.6 * (78)
Maltase	mg/ml	17.6 ± 1.3 (22)	3.99 ± 0.38**(72)
	mg/ejac.	46.05 ± 5.0 (22)	7.58 ± 0.85**(72)
Citric acid	mg/ml	7.22 ± 0.45 (22)	5.61 ± 0.28* (74)
	mg/ejac.	18.00 ± 1.35 (22)	10.79 ± 0.69* (74)
LH	mIU/ml	603.7 ± 36.97 (22)	489.1 ± 17.33* (72)
	mIU/ejac.	1680.0 ± 167.21 (22)	1108.85 ± 86.66* (72)
FSH	mIU/ml	10.9 ± 0.62 (22)	6.7 ± 0.18**(72)
	mIU/ejac.	31.4 ± 3.88 (22)	14.96 ± 0.92**(72)
Prolactin	ng/ml	188.8 ± 11.6 (22)	114.0 ± 7.4 **(72)
	ng/ejac.	623.6 ± 90.8 (22)	233.7 ± 22.7 **(72)
GPC	µM/ml	2.53 ± 0.03 (22)	1.29 ± 0.02**(72)
	uM/ejac.	6.7 ± 0.51 (22)	2.66 ± 0.21**(72)
Sodium	mg/ml	3.39 ± 0.05 (16)	3.37 ± 0.05 (32)
	mg/ejac.	9.83 ± 0.35 (16)	6.74 ± 0.10**(32)
Potassium	mg/ml	1.12 ± 0.08 (16)	1.06 ± 0.06 (32)
	mg/ejac.	3.25 ± 0.23 (16)	2.12 ± 0.13**(32)

* P<0.01 ** P<0.001

Values are expressed as Mean ± S.E.

Number of cases studied are given in parenthesis

observed that concentration of most of the seminal plasma constituents secreted by the prostate gland were decreased whereas seminal vesicular secretion concentrations remained unaffected as a result of vasectomy, it is concluded that the prostatic function is decreased following vasectomy whereas the seminal vesicle function remains unaffected.

STUDIES ON REVASANASTOMOSIS

The major limitation in the use of vasectomy as a means of fertility control is that its reversibility cannot be assured. The exact cause(s) for the low rate of fertility in vas reanastomosis is not known. It has been attributed to many factors such as techniques used for reanastomosis[12], possible impaired accessory reproductive organ function[13], development of immunological consequences[2,14,15] and physiological changes after vasectomy.

Studies at the IRR on the effect of vas reanastomosis on accessory organ function indicate that most of the secretory products which decreased as a result of vasectomy gradually came back to normal levels (Table III). This suggests that the prostatic function which decreased as a result of vasectomy improves to normal levels after reanastomosis, indicating that the low rate of fertility after vas reanastomosis is not because of the decreased prostatic function as a result of vasectomy.

The failure to impregnate after attaining normal sperm counts in many cases has been reported by several investigators. Pardanani *et al*[13] observed that vasectomy leads to epididymal damage to some extent which might be a cause for the poor fertility in vas reanastomosis cases with normal sperm count, as sperms have been shown to undergo maturation in the epididymis. Observations at the IRR on GPC levels after vas reanastomosis and comparison with normal values suggest that vasectomy may not lead to altered epididymal secretory function and the probability of the epididymis affecting sperm maturation after vasectomy seems to be unlikely. However, there is a time gap before spermatozoal adenyl cyclase returns to normality after vas reanastomosis (Table IV). The concentration of cyclic AMP in spermatozoa is a sensitive indicator of sperm activity[16]. Cyclic AMP has been shown to be involved in all the processes starting from the motility to the capacitation of spermatozoa[17-19].

Table III

Effect of vas reanastomosis on semen volume and seminal plasma concentrations of citric acid, maltose, acid phosphatase and GPC

(Mean ± S.E.)

Parameters	Before vas reanastomosis	After vas reanastomosis		
		1 - 3 months	3 - 6 months	6 - 12 months
Volume ml	1.81 ± 0.24	2.25 ± 0.32	2.70 ± 0.29*	2.90 ± 0.26**
Citric acid mg/ml	6.20 ± 0.52	7.36 ± 0.63	7.77 ± 0.69*	8.24 ± 0.62**
Maltase mg/ml	3.03 ± 0.39	15.56 ± 2.82***	17.40 ± 2.88***	18.67 ± 2.74***
Acid phosphatase mM/ml	234.00 ± 18.56	207.00 ± 20.70	218.00 ± 19.66	217.00 ± 19.82
GPC µM/ml	1.17 ± 0.06	2.39 ± 0.09#	2.47 ± 0.14#	2.49 ± 0.11#

Data analyzed using paired 't' test.

* P<0.05 ** P<0.01

***P<0.001 # P<0.0001

Table IV

Adenylate cyclase activity* of spermatozoa at different durations after vas reanastomosis

Duration after vas reanastomosis	cAMP levels Mean ± S.E.
1 - 3 months (n=6)	28.60 ± 6.22
3 - 6 months (n=7)	31.14 ± 4.47
6 - 12 months (n=8)	39.66 ± 6.77
Control (n=15)	38.48 ± 5.78

* Adenylate cyclase activity is expressed as p moles of cAMP produced/mg of spermatozoal protein/10 minutes.

These studies demonstrate that as yet, factors controlling restoration of fertility after vasanastomosis are not fully understood, and reversibility following revasanastomosis is still a puzzling problem.

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Contributed by Dr. A.R. Sheth and colleagues, Institute for Research in Reproduction, Bombay.

ABSTRACTS

Some Research Projects completed recently

Genetic and orthodontic studies of cleft lip and/or cleft palate, a hospital based study

The study was undertaken on 315 (188 males and 127 females) cases of cleft lip and/or cleft palate in whom detailed pedigrees, medical history, dental morphology, dermatoglyphics and anthropometry were studied. It was observed that in spite of a higher incidence of the anomaly in males it could not be assigned as a sex limited anomaly. Bilateral differences showed a preponderance of left sided clefts. The incidence of cleft lip/palate (1 per 700 live births) on investigation was assigned to familial and teratogenic aetiology in about 30 per cent of cases, while the remainder were thought to be sporadic in origin. In cases where the anomaly was associated with other anomalies (syndromes) changes in chromosome picture were observed.

S.S. Sidhu
Department of Dental Surgery
All India Institute
of Medical Sciences
New Delhi.

Publications:

1. Sidhu, S.S., Grewal, M.S. and Deshmukh, R. Cleft lip and cleft alveolus with post-axial hexadactyly: A rare syndrome. In: Medical Genetics in India Vol. I (Aurora Enterprises, Pondicherry) 1978, p.63.

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The effect of Indian diets of different composition and consistency on the secretion of acid by and the buffer capacity of the stomach

The relationship between various components of diets in India and gastric acid secretion was investigated in an attempt to ascertain which foods caused a high acid secretion as this information might prove useful in advising ulcer prone patients on their dietary regulation. The results indicated that tea is a potent stimulant of gastric acid secretion eliciting a response equivalent to that obtained after maximal histamine stimulation. Tea without milk and sugar caused a 'supra maximal' acid output; milk and sugar reduced this effect.

Chillies added to a meal resulted in a much higher acid response than that after a 'maximal' dose of histamine or a meal without chillies. This response was more pronounced in ulcer patients than controls. Masticatory and non-masticatory diets stimulated equally gastric acid secretion but masticatory diets were found to be better buffers than non-masticatory diets. Wheat, bajra, maize and rice resulted in nearly equal acid outputs. Wheat based *chapatis*, however, were the best buffers of these and parboiled rice had the least buffering capacity.

Ulcer prone patients should therefore, avoid chillies and tea (especially black tea without milk and sugar), chew their food thoroughly and have a wheat based rather than a rice based diet.

S. Nundy
Department of Surgery
All India Institute
of Medical Sciences
New Delhi.

Rhythms in isoprene biogenesis

A new circadian rhythm in the utilization of mevalonate was discovered. The enzyme responsible for this rhythm was found to be MVAPP decarboxylase. This enzyme was also shown to be rate-limiting in the mevalonate segment of the sterol pathway. Improved methods for the synthesis of 1-^{14}C MVAP and 1-^{14}C MVAPP and micro assay methods for MVA kinase, MVAP kinase and MVAPP decarboxylase were developed.

MVAPP decarboxylase from rat brain and liver were shown to be inhibited by phenyl and phenolic acids. This may explain the toxicity of phenyl acids in phenylketonuria being the cause for decreased cholesterol synthesis. MVAPP decarboxylase was purified to homogenity by affinity chromatography using a novel approach making use of an inhibitor of the enzyme to bind the enzyme.

HMGCoA reductase was shown to be inhibited by ATP and ADP. The inhibition could not be reversed by hexokinase, while it could be prevented by adenosine compounds and Ca^{++}.

HMGCoA reductase was shown to be regulated by the adenylate charge. Palmityl CoA inhibited HMGCoA reductase competitively. Fatty acyl CoA inhibition was different from ATP.Mg inhibition. That ATP may not be responsible for circadian rhythm in HMGCoA reductase was shown by studying the kinetic parameters of midnight and noon enzymes treated with ATP.Mg *in vitro*.

The effects of vanadium on cholesterol biogenesis was localised to HMGCoA reductase, reduced vanadium was found to be the active form. The inactivating enzyme was also found to be affected by vanadate.

HMGCoA reductase activity decreased during the period of solar eclipse on February 16, 1980, as compared to an identical experiment carried out on the previous day.

The microsomal inactivating enzyme of HMGCoA reductase was shown to have a rhythm with high activity at midnight and low activity at noon.

T. Ramasarma
Department of Biochemistry
Indian Institute of Scienc
Bangalore.

Publications:

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SUMMARY OF KSHANIKA AWARD (1979) ORATION

Dr. Satyavati Chandra, Scientist E, Industrial Toxicology Research Centre, Lucknow, delivered the Kshanika Award (1979) Oration on Clinical and Experimental Manganese Toxicity at the Indian Council of Medical Research, New Delhi, on February 12, 1981.

Manganese is extensively used in the manufacture of steel, dry battery cells, pigments and paints, in the coatings of electrodes of welding rods, in ceramics and various chemical industries. Recently, compounds of manganese are also being utilised as additives to various fuel oils, wood preservatives and in fertilizers.

India ranks third in the production of manganese ores in the world. A large number of workmen engaged in mining and various manganese based industries are exposed to the dust or fumes of this metal. Besides this the general population is also exposed to the hazards of manganese due to its presence in the biosphere. Excessive exposure to manga-

nese produces a chronic neurological disorder, the symptoms of which resemble those of parkinsonism. A number of reports of manganese poisoning among miners and industrial workers in India coupled with nonavailability of suitable diagnostic methods for early detection of poisoning and institution of therapeutic measures prompted clinical and experimental studies at the Central Drug Research Institute, Lucknow, on the problems associated with manganese toxicity.

Clinical and biochemical studies were conducted in suspected cases of manganese poisoning among underground drillers in Balaghat and Ukwa manganese mines near Nagpur. On the basis of neurological examination the cases were divided into mild, moderate and severe grades of poisoning. A significant increase in serum calcium and adenosine deaminase levels was observed in cases of mild and moderate grades of poisoning respectively.

Welders from three big industrial units in Bombay were investigated for the possible occurrence of manganese poisoning due to the exposure to welding fumes containing this metal. A number of welders were diagnosed as cases of early manganese poisoning on the basis of evidence of overexposure to manganese by the findings of increased urinary levels of this metal, signs of early neurological involvement and increased content of serum calcium. The metal content of air around the welder's breathing zone was found to be higher than maximum allowable concentrations at few locations. These studies indicated the possible occurrence of manganese poisoning among welders and confirmed the diagnostic significance of hypercalcaemia in the early detection of the disease process.

In order to unravel the pathogenesis of manganese encephalopathy the significance of the derangement in the metabolism of central chemical mediators was investigated in laboratory animals. Exposure to manganese produced hypermotility in animals during early phases, which was found to be due to the increase in the striatal contents of catecholamines. These neurochemical alterations were produced due to enhanced turnover rate as indicated by the increased conversion of labelled (3,5,^{3}H) tyrosine to ^{3}H labelled catecholamines and increased rate of decline of endogenous dopamine and norepinephrine following inhibition of synthesis by the administration of α-methyl-p-tyrosine. This phase of behavioural dysfunction due to the underlying changes in the chemical mediators corresponds to the development of the psychiatric phase in humans. As the exposure continues, the derangement in the physiology of other biomolecules in the neural structures leads to neuronal degeneration particularly in the region of the basal ganglia. At this stage the impairment of dopaminergic response is responsible for akinesia seen during the intermediate phase of the poisoning in man. Severe neuronal loss and marked reduction in the contents of brain catecholamines in chronic toxicity correspond to the established phase of poisoning in humans. On the basis of these observations it has been possible to propose a pathogenetic mechanism for manganese intoxication. Furthermore, the use of L-dopa in the treatment of early manganese poisoning is being contraindicated on the basis of the findings of increased levels of central catecholamines during early phases of toxicity.

In conclusion, hypercalcaemia has been found to be an useful test for early detection of manganese poisoning. A model for manganese induced behavioural aberrations with its underlying neurochemical mechanism has been developed which has provided a better understanding of the pathogenetic mechanism of manganese encephalopathy. L-dopa therapy during early phases of manganese poisoning has been contraindicated on the basis of early neurochemical changes.

ICMR NEWS

The Hon'ble Prime Minister of India, Smt. Indira Gandhi, laid the foundation stone of the ICMR Regional Medical Research Centre at Bhubaneswar, on March 29, 1981.

The ICMR Awards and Prizes were distributed by Shri B. Shankaranand, Union Minister of Health and Family Welfare, to outstanding Biomedical Scientists on March 20, 1981. A monograph on 'Anophelines of India' authored by Dr. T. Ramachandra Rao was released by Shri Shankaranand the same day.

*** *** ***

The Scientific Advisory Board of the Council met in New Delhi on March 9-10, 1981.

The following Expert/Advisory Groups met during the month, at the ICMR:

Expert Group to assess the anti-leprosy vaccine prepared from ICRC bacilli	March 12, 1981
Advisory Group of ICMR's National Programme for Research in Human Reproduction	March 12-14, 1981

Workshops/Conferences/Seminar:

Dr. V. Ramalingaswami, Director-General, inaugurated the Indo-US Workshop on 'Rheumatic Fever in the 1980's' at New Delhi on March 2, 1981.

Dr. V. Ramalingaswami, inaugurated the Indo-French Colloquium on 'Gene Cloning and Problems of Tropical Diseases' at the All India Institute of Medical Sciences,New Delhi, on March 4, 1981.

Dr. V. Ramalingaswami, participated in a meeting of the WHO SEA/ACMR sub-committee on 'Research Administration' held at New Delhi, between March 4-6, 1981.

Dr.S.K. Kashyap,Deputy Director, National Institute of Occupational Health, Ahmedabad, participated in a workshop on 'Education and Safe Handling of Pesticides Application' held at Buenos Aires from March 12-18, 1981.

Dr. V. Ramalingaswami, participated in a WHO interregional meeting on 'Appropriate Technology for Health' held at New Delhi between March 24-31, 1981.

New Appointments:

Dr. A.C. Ghosh has been appointed as Assistant Director, National Institute of Cholera & Enteric Diseases, Calcutta; Dr. P.K. Das and Dr. K. Balaraman as Senior Research Officers, Vector Control Research Centre, Pondicherry; and Dr. S.K. Parida as Senior Research Officer at Malaria Research Centre, Delhi.

ICMR AIDED SYMPOSIA/SEMINARS/WORKSHOPS/CONFERENCES

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
Seminar on Primary Health Care-World Implementation Experiences.	February 28 - March 2, 1981	Institute of Medical Sciences, Banaras Hindu University, Varanasi.
Workshop on Techniques Employed in Light Microscopic Studies for Biology Teachers.	March, 1981	Department of Anatomy, Postgraduate Inscitute of Basic Medical Sciences, Madras.
Indo-US Workshop on Rheumatic Fever in the 1980's.	March 2-5, 1981	All India Heart Foundation, New Delhi.
First National Workshop on Neonatal Surgery.	March 2-7, 1981	Department of Paediatric Surgery, All India Institute of Medical Sciences,
Seventh National Workshop on Basic Techniques in Bacteriology and Serology for Surveillance of Rheumatic Fever.	March 6, 1981	Department of Microbiology, Lady Hardinge Medical College and Hospital, New Delhi.

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
National Symposium on Corneal Disasters.	March 10-12, 1981	Dr.Rajendra Prasad Centre for Ophthalmic Sciences, New Delhi.
First All India Symposium and Workshop on Anaerobic Infections in Man.	March 14-24, 1981	Department of Microbiology, All India Institute of Medical Sciences, New Delhi.
Workshop in Primary Health Care in Rural Areas with Special Reference to the Nurpur Bedi Pilot Project in Punjab.	March 16-18, 1981	Chandigarh (Institute of Economic Growth, Delhi).
Workshop on Standardised Analysis of Diagnostic and Socio-demographic Data at the National Level.	March 23-24, 1981	Department of Psychiatry, Postgraduate Institute of Medical Education and Research,Chandigarh (Indian Psychiatric Society).
Workshop on Hospital Infections with Special Reference to Gram Negative Bacilli.	March 26- April 1, 1981	Department of Microbiology, All India Institute of Medical Sciences, New Delhi.
Symposium on Trends in Lower Limb Prosthetics.	March 28-29, 1981	Artificial Limbs Manufacturing Corporation of India, Kanpur (Orthotics and Prosthetics Society of India).
Public Health Problems in Desert Environment.	April, 1981	SMS Medical College, Jaipur.
Symposium on Photophysical and Photochemical Process in Chemical and Biological Systems.	April 14-16, 1981	Mahabaleshwar (Indian Photobiology Society).
Workshops on Recent Advances in the Field of Cytogenetics and Biochemical Genetic Disorders; Approaches and Methods of Early Intervention with Handicapped Infants and Children and their Families; and Prenatal Diagnosis - Place of Fetoscopy and Amniocentesis.	May 1-2, 1981	Department of Pediatrics, Seth G.S. Medical College and KEM Hospital, Bombay.
Guha Research Conference 1981.	May 15-20, 1981	University of Kashmir, Srinagar, Kashmir.

PROGRAMME OF SCIENTIFIC LECTURES AT THE INDIAN COUNCIL OF MEDICAL RESEARCH, NEW DELHI

Date	Topic	Speaker
5.3.1981	Immunology in Clinical Medicine (Shakuntala Amir Chand Prize 1979)	Dr. A.N. Malaviya, New Delhi.
2.4.1981	Genetic Disorders in Pediatrics	Dr. I.C. Verma, New Delhi.

COUNCIL'S TRAINING PROGRAMMES FOR 1981

Leprosy:

At the Central Jalma Institute for Leprosy, Agra:

Training course in Leprosy for medical officers: (February 15 to March 28, 1981, and August 31 to October 14, 1981).

Virology:

At the National Institute of Virology, Pune:

(1) Diploma course in Medical Virology of Poona University: (July, 1981).

(2) *Workshop on Japanese Encephalitis in India.

Endocrinology:

At the National Institute of Nutrition, Hyderabad:

Annual certificate course in Endocrinological Techniques and their Application: (August to September, 1981).

Nutrition:

At the National Institute of Nutrition, Hyderabad:

(1) Summer School in Health and Nutrition for science teachers from Teachers' Training Institutes: (May/June, 1981).

(2) Annual certificate course in Human Nutrition for teachers from Agricultural Universities: (June/July, 1981).

(3) M.Sc. (Applied Nutrition) course: (June 1, 1981 to February 28, 1982).

(4) Annual certificate course in Public Health Nutrition: (October/November, 1981).

(5) Annual certificate course in Nutrition: (December 1, 1981 to February 28, 1982).

Haematology:

At the Blood Group Reference Centre, Bombay:

(1) A certificate course in Blood Banking Technology and Basic Haematology for medical officers: (February 1 to March 15, 1981).

(2) Training course in Blood Banking Methodology for technicians: (May 12-26, 1981).

Occupational Health:

At the National Institute of Occupational Health, Ahmedabad:

NIOH/WHO Training Course on Air Pollution and Health: (June, 1981).

Clinical Pharmacology:

*At the Department of Pharmacology, Seth G.S. Medical College, Bombay.

Biostatistics:

At the Institute for Research in Medical Statistics, New Delhi:

(1) Certificate course in Planning and Evaluation of Health Programmes: (April, 1981).

(2) Diploma course in Biostatistics: (September, 1981).

(3) Certificate course in Orientation to Biostatistics: (September, 1981).

(4) Certificate course in Statistical Techniques in Medical Research: (January, 1982).

Laboratory Animal Technology:

At the National Institute of Nutrition, Hyderabad:

(1) Laboratory Animal Supervisors Training Course: (January 2 to March 31, 1981).

(2) Laboratory Animal Technicians Training Course: (August 1 to September 30, 1981).

COURSES FOR TALENT SEARCH SCHEME FELLOWS

Cell-Biology and Cyto-Genetics:

At the Indian Institute of Science, Bangalore: (March, 1981).

Use of Radioisotopes in Medicine:

At the National Institute of Nutrition Hyderabad: (July, 1981).

Immunological Techniques:

At the Central Jalma Institute for Leprosy, Agra: (November, 1981).

Haematological Techniques:

*At the Department of Pathology, Christia Medical College, Vellore.

Clinical Endocrinology:

*At the Institute for Research in Reproduction, Bombay.

* Dates to be announced later.

Revision of contingency grants for ICMR Fellowships

With regard to the revision of stipend rates and contingency grants for ICMR Fellowships announced on page 35 of the February, 1981 issue of the ICMR Bulletin, it is hereby notified that the revised contingency grant per annum has been further modified as Rs.3000.00 for Junior Research Fellowship, Rs.4000.00 for Senior Research Fellowship and Rs.4000.00 for Research Associate, instead of Rs.5000.00, Rs.7000.00 and Rs.10000.00 respectively.

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METABOLIC CONSEQUENCES OF STEROIDAL CONTRACEPTIVES

The development of oral contraceptives (OC) is a major breakthrough in the field of contraception. This effective mode of contraception has been used for over two decades and it is believed that about 54 million women are using hormonal contraceptives all over the world[1]. Due to the widespread use of these hormones, interest in the study of the side effects is continuously growing. It is, therefore, necessary that a rationalistic view of the benefits to risk ratio is taken by scientists as well as policy makers of the countries concerned.

While elaborating on the metabolic effects of contraceptive hormones, it must be borne in mind that the dosage of the active components are being reduced considerably to achieve the highest efficacy to side effects ratio.

Effects of steroidal contraceptives on liver function:

Earlier work at the Institute for Research in Reproduction (IRR), Bombay, was directed to animal models. Thus in rabbits, Enovid(R) (4.0 mg norethenodrel and 0.85 mg mestranol) a well known combination OC used in the 1970's was shown to cause a rise in serum transaminase; the rise was transitory, levels returning to normal in spite of continued treatment[2]. Enovid also caused bromsulphthalein retention in rabbits and a small but significant fall in serum proteins, possibly due to a fall in albumin levels[3]. These observations were similar to those made by other workers in human subjects receiving Enovid, indicating that the rabbit is a good model for studying possible actions of these steroids on the liver. In rats however, Enovid did not cause any changes in serum transaminases. In animals maintained in a state of minimum liver injury by repeated injections of small doses of carbon tetrachloride (CCl_4), Enovid caused a rise in serum transaminases. A frank liver damage induced with large acute doses of CCl_4, was further aggravated by Enovid but the subsequent regeneration was not affected[4]. Rats maintained on a low protein diet showed raised levels of serum transaminases after Enovid therapy[5].

However, studies on liver function tests in women taking combination steroids or low dose progestogen compounds did not show any alterations[6-9]. Serum bile acid, believed to be a sensitive parameter for subclinical liver damage was also shown to be unaltered after low dose combination contraceptives[10].

Carbohydrate metabolism in steroidal contraception:

In a recent study supported by the World Health Organization, 15 per cent of the subjects developed an abnormal glucose tolerance while taking low dose combination contraceptives containing 150 µg levonorgestrel combined with either 30 or 50 µg ethinyl estra-

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diol. The limits for a normal GTT were as follows:

Fasting plasma glucose : 110 mg per cent; glucose at 1 hr : 170 mg per cent; glucose at 2 hr : 130 mg per cent; and difference between 2 hr glucose and fasting glucose : > 20 mg per cent.

If 2 out of these 4 criteria were beyond the limits the test was considered as abnormal.

It was observed that the fasting glucose in all the cases was normal and none of the individuals developed signs and symptoms of clinical diabetes. Further, the GTT returned to normal within 3 months of discontinuation of contraception[11]. Since the study was restricted to the use of steroids for one year only,the incidence of abnormal GTT after long-term use could not be ascertained. Also the study could not identify women at risk of developing abnormal GTT. However a previous study at IRR, which used intravenous GTT, indicated that the women with a family history of diabetes, or with a history of having delivered large babies or excessive weight gain while on therapy were at risk of developing an abnormal GTT[12-13].

As is popularly believed, the property of changing the tolerance to glucose seems to be restricted to the estrogenic component. The glucose tolerance test in almost all the individuals using progestogen alone contraceptives either orally, or in an injectable form (DMPA) or through vaginal rings (limited data) remains normal (unpublished data). The amount of estrogen (30 or 50 µg ethinyl estradiol) does not make any difference since the incidence and extent of the abnormality is similar with both the doses[11].

Lipid and protein metabolism in steroidal contraception:

The circulating levels of lipids, raised levels of which are considered to be a risk factor for atherosclerosis, are largely dependent on dietary habits as well as genetic factors. In view of the inadequate diets consumed by many Indian women belonging to low socio-economic classes, influence of steroidal contraceptives on the lipid profile of these women is likely to be of lesser consequence than in their counterparts in Western populations.

The effect of steroidal contraceptives on the serum lipids may depend on the composition of the particular preparation. In a detailed study carried out by Donde and Virkar[14-15] it was observed that megestrol acetate (500 µg daily) did not cause any alteration in the plasma lipids (cholesterol, triglycerides, phospholipids and free fatty acids). Another progestogen, norgestrel (50 µg or 75 µg daily) reduced all the components except triglycerides. When the progestogen was combined with ethinyl estradiol (500 µg dl norgestrel + 50 µg ethinyl estradiol), the lipid components were elevated. This was also true for another combination contraceptive (ethinodiol diacetate 0.5 mg + ethinyl estradiol 50 µg) and a monthly pill (2.5 mg quingestanol acetate + 2 mg quinestrol). When the norgestrel content of the pill was reduced from 500 to 300 µg, a reduction in cholesterol was seen. Triglycerides remained slightly elevated[11]. It must be mentioned here that most of the changes occurring in lipid composition were within physiological limits.

Recently, it has been suggested that an increase in low density lipoprotein cholesterol and a decrease in high density lipoprotein cholesterol reflect diminished tissue catabolism and favour acceleration of atherosclerosis[16]. Whether the steroidal contraceptives would cause such changes remains to be seen. Such a study is under progress.

Changes in various blood serum proteins after contraceptive steroids have been reviewed extensively[17]. Studies at the IRR showed that even a low dose combination causes a slight decrease in albumin[11]. Since the changes are marginal, these are unlikely to influence the general nutritional status of oral contraceptive users.

Oral contraceptives and vitamin status:

In a recent review by Bamji[18], the influence of steroidal contraceptives on B complex vitamin nutrition has been widely covered. IRR results[19] are similar to those reported by Bamji. Thus it has been shown that in women using combination contraceptive steroids,there may be a change in the requirement of B_6. A question that is often raised is whether women who are already marginally deficient in vitamins as reflected by biochemical parameters, will have aggravation of the deficiency after steroidal contraception. Preliminary data collected by a World Health Organization Task Force in which the IRR participated, indicate that this may not be the case.

It was also observed at the IRR, that in women using the oral combination steroids ascorbic acid content of the leucocytes was reduced to 50 per cent of the pretherapy value[20]. The plasma ascorbic acid however, was not affected. Since leucocyte ascorbic acid is closely related to phagocytic activity it remains to be seen whether the latter is affected in OC users. This work is under progress.

Interaction of steroidal contraceptives with other drugs:

It is understood that while practicing contraception, other drugs are likely to be administered for intercurrent diseases. The possibility of drug-hormone interaction cannot be ruled out. Studies were therefore carried out at IRR in collaboration with the KEM Hospital, Bombay, to assess drug-hormone interaction. Results indicated that ampicillin, para-aminosalycylic acid (PAS), isonicotinic acid hydrazide (INH) and streptomycin did not influence the contraceptive efficacy of the preparation used (norethindrone acetate 1 mg and ethinyl estradiol 30 µg) and effective levels of these drugs were maintained in the presence of contraceptive steroids. Metronidazole however, caused escape ovulation in some women without altering the serum drug levels. Rifampicin either caused escape ovulation or menstrual irregularities and these effects were related to a decrease in the bioavailability of norethindrone and/or ethinyl estradiol[21].

Miscellaneous effects of steroidal contraceptives on body metabolism:

Though combination contraceptives alter certain parameters of thyroid function, the subject remains in a euthyroid condition with a new homeostasis being established. With low dosage progestogens, no alteration in the thyroid function parameters is seen[22].

One major concern about steroidal contraceptives is their possible connection with thromboembolism. At the IRR various parameters for coagulation of blood, *viz.* bleeding and clotting time, prothrombin time and levels of antithrombin III were studied in OC users. With combination contraceptives containing 0.5 mg of ethinodiol diacetate and 0.05 mg of ethinyl estradiol, except for antithrombin III, which was significantly reduced, no other changes were noted. However, because of higher basal levels in Indian women, the reduced antithrombin III levels may not lead to any serious consequences[23].

Changes in trace metals like copper (increase in serum copper) and zinc (decrease) were noticed after combination steroids containing 150 µg levonorgestrel and 30 or 50 µg ethinyl estradiol[24]. It is not clear whether the increase in serum copper is at the expense of tissue levels. If so, a decrease in hemoglobin is expected in view of the role of copper in hemoglobin synthesis. In fact a slight decrease in hemoglobin (0.3 g/100 ml) was seen in OC users. Zinc level may be reduced because of a decrease in albumin, which is a carrier for zinc.

Metabolic effects of steroidal contraceptives vis-a-vis malnutrition and parasitic infestations:

The population in which these studies have been carried out is not very well nourished as shown by the differences in anthropometric parameters and some of the biochemical parameters[11]. As compared to well nourished controls about 50 per cent of the women enrolled for trials on contraceptives had parasitic infestations (ascariasis, trichuriasis, amoebiasis and ankylostomiasis). It was observed that the degree of changes in various metabolic parameters was not different than those reported in the literature indicating thereby that the nutritional deficiency in women studied was not aggravated by steroidal contraceptives.

Response of women with parasitic infestation was some what different from those without such infestation[25]. Thus it was the women without infestation who showed greater changes for glucose. The decrease in iron was seen in contraceptive users with infestation but not in those without infestation. This indicates that the presence of parasitic infestation could modify the influence of contraceptive steroids on metabolic functions.

From the above discussion, it is clear that hormonal contraceptives do bring about changes in metabolism. Most of the changes are similar to those occurring during pregnancy. Some of them are adaptive changes within physiological limits. The study and knowledge of metabolic side effects are most helpful in monitoring individual subjects, when a physician has to make a final decision of withdrawing or continuing the steroidal contraceptive should a subject experience clinical side effects.

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Contributed by Dr. Usha M. Joshi and colleagues, based on the studies carried out at the Institute for Research in Reproduction, Bombay.

ABSTRACTS

Some Research Projects completed recently

Role of fluorides in enhancing the success rate of replantation of teeth

A clinical and radiological study was undertaken to assess the role of fluorides in enhancement of the success rate of replantation of teeth otherwise indicated for extraction. A total of 361 replantations were performed during the study on patients with ages ranging from 9 to 55 years. All teeth from incisors to 2nd molars were considered for replantation but maximum number of replants were mandibular 1st molars. Teeth included in the study were carious exposed, traumatically evulsed teeth and had periapical involvement. The patients (teeth) were treated by conventional methods or conventional methods and 2 per cent sodium fluoride or by sodium fluoride alone.

The results revealed that the time consuming root canal treatment in replantation procedures did not enhance the success rate of replantation and thus could be avoided. The periodontal membrane and extra-oral period were not found to play much part in the ultimate success of replantation. Fluorides were found to reduce the resorption of the root in replants and enhance the success rate.

S.K. Mahajan
S.S. Sidhu
Department of Dental Surgery
All India Institute
of Medical Sciences
New Delhi.

Publication:

Mahajan, S.K. and Sidhu, S.S. Effect of fluoride on the root resorption of autogenous dental replants - A clinical study. *Aust Dent J 26:* 42, 1981.

Development and testing of a variable flow rate drug infusion pump for intravenous and intra-arterial infusion of drugs

A variable flow rate drug infusion pump which can be used for intra-arterial or intravenous infusion of drugs has been designed and developed. The pump can be used in clinical practice as well as for experimental research. The pump can take syringes of different sizes (5, 10, 20, 30 and 50 ml capacity) thus allowing 5 different rates of infusion. In addition, there are 3 motor speeds, thus there can be 15 variable flow rates with a range of 1 ml/hr to 27 ml/hr. The pump has provision to take 2 identical syringes thus facilitating 2 drug-infusions being made simultaneously. The accuracy of flow rate against minimal resistance, *e.g.* intravenous, is good. However, the error is high against resistance, *e.g.* intra-arterial, ranging from 2.3 per cent to 19.3 per cent. The machine is designed to give a linear push to the syringe providing a continuous flow. This indigenously produced variable infusion pump is cheap, portable, has a low weight and good accuracy of infusion.

K.M. Patil
Department of Applied Mechanics
Biomedical Engineering Division
Indian Institute of Technology
Madras.

SUMMARY OF THE SHAKUNTALA AMIR CHAND PRIZE (1979) LECTURE

Dr. A.N. Malaviya, Assistant Professor, Department of Medicine, All India Institute of Medical Sciences, New Delhi, delivered the Shakuntala Amir Chand Prize (1979) Lecture on Immunology in Clinical Medicine at the Indian Council of Medical Research, New Delhi, on March 5, 1981.

One of the fundamental biological properties of the cells is mutual recognition and communication among themselves. Studies at several laboratories around the world have shown that most of the somatic cells are endowed with surface receptors which allow such mutual cell recognition. The mutual recognition system is necessary not only for tissue morphogenesis and function but appears to be also involved in another fundamental biological property at the cellular level namely, discrimination between 'self' and 'non-self'. This property is associated with lymphocytes, the main cells of the immune system which are concerned with the defence of the body.

Abnormalities in the functioning or development of the immune organ or immune response are being implicated in a wide variety of diseases. Over the past 12 years a large number of these patients have been seen, diagnosed and taken care of at the Clinical Immunological Service of All India Institute of Medical Sciences (AIIMS), New Delhi. A simple classification has been evolved for such diseases which helps in organizing and planning the relevant investigations. Many a time the further plan of therapy and management also depends on these investigations. This classification is described here: (i) Immunodeficiency diseases: maldevelopment of the immune organ, hereditary or congenital, leading to deficiency in the functioning of the immune response; (ii) Immunomalignancies: neoplastic transformation of the cells involved in the immune response; and (iii) Immunoinflammatory diseases: inherent or acquired defect in immunoregulation leading to imbalanced and persistent immune response, which, in turn, leads to immunoinflammatory diseases of different types *viz.* generalized immunoinflammatory diseases or immunoinflammatory diseases of organ systems of the body.

Systemic connective tissue diseases (collagen-vascular diseases) and different forms of vasculitis belong to the category of generalised inflammatory diseases. At the AIIMS, over the past 12 years, extensive studies have been carried out in this group of diseases. Major findings indicate that rheumatoid arthritis is quite common in India but relatively less severe than in the West. It is less often seropositive (only about 50 per cent), and the majority of the patients respond well to correct doses of aspirin. In relatively resistant patients the second line of drugs including the gold-thiols, d-penicillamine and levamisole give excellent results. Systemic lupus erythematosus is also not uncommon in India. More than 150 cases have been seen and studied extensively. The disease is not significantly different from that seen in the western world. Aspirin and chloroquin are very effective except in those with kidney involvement, where prednisolone, cyclophosphamide and/or azathioprine have been used with excellent results. Antinuclear antibody screening test has been most rewarding in detecting this disease. A large number of cases of systemic sclerosis have been seen showing minimal skin changes but with extensive lung and gastrointestinal involvement and typical serum autoantibodies. At present work is in progress on the analysis of immunospecificities of antinuclear antibodies and their clinical correlates. Plasmapheresis has been carried out manually in 16 patients with remarkable results in systemic lupus erythematosus and essential mixed cryoglobulinemia but not in systemic sclerosis. Plasmapheresis seems to be a new mode of therapy which needs more extensive trials.

ICMR NEWS

Shri B. Shankaranand, Union Minister for Health and Family Welfare, inaugurated the National Workshop on Appropriate Technology for Primary Health Care at the Indian Council of Medical Research, New Delhi, on April 23, 1981. Over 80 national and international experts in the field participated in the workshop which concluded on April 26, 1981.

*** *** ***

ICMR Expert Groups on 'Health Services Research' and 'Problems of Coal Mines' met at

the Council on April 9, 1981 and April 18, 1981 respectively.

*** *** ***

Dr. V. Ramalingaswami, Director-General, Indian Council of Medical Research, delivered the 15th Convocation Address of the Indian Statistical Institute, Calcutta, on March 31, 1981.

*** *** ***

Dr.S.C. Pal, Director, National Institute of Cholera and Enteric Diseases, Calcutta, participated in a Steering Committee meeting of the WHO Scientific Working Group on Bacterial Enteric Infections held at Geneva between March 30 - April 1, 1981.

Dr. P.K. Rajagopalan, Director, Vector Control Research Centre, Pondicherry, participated in a Steering Committee meeting of the WHO Scientific Working Group on Biological Control of Vectors held at Geneva between March 30 - April 3, 1981.

*** *** ***

Dr. S. Hariharan, Research Officer, Laboratory Animal Information Service, Hyderabad, proceeded on a WHO fellowship for advanced training in Laboratory Animal Science and Technology at the Northeast Surrey College of Technology, London.

WORLD HEALTH DAY - APRIL 7, 1981
"HEALTH FOR ALL BY THE YEAR 2000"

Although health is accepted as a basic human right, the majority of the world's population have little or no access to even the most rudimentary form of health care. Unfortunately however, these are the very people who are vulnerable to disease, have a high degree of morbidity and are therefore in utmost need of health services. There is now a global realization of the importance of health for community development and for the attainment of a better quality of life for all people. The emphasis is not merely on the improvement of individual health but on the health of the community as a whole. This major social goal is set at 'attainment by all the citizens of the world, by the year 2000, of a level of health that will permit them to lead a socially and economically productive life'. It is in this context that WHO has chosen the theme for this year's World Health Day, as 'Health for All by the Year 2000'.

The major objective of the national health policy to provide health for all by 2000 A.D., implies the provision of a good and adequate health care system for all citizens especially for women and children as well as the poor and underprivileged groups. It also implies a drastic reduction in the total morbidity and mortality.

The various aspects of the goal 'Health for All by the Year 2000' are:

- Health education concerning prevailing health problems and their prevention;
- Nutrition education and healthful living;
- Provision of MCH services including family planning;
- Immunization against infectious diseases;
- Appropriate treatment and prevention of common diseases and injuries; and
- Mental health

All these aspects form an integral part of socio-economic development and need to be developed with the full participation of the individual, family and the community. It is only through appropriately developed health services at the local level supported by suitable referral systems, that effective health care can be brought within the reach of far-flung rural populations in the developing countries.

In order to realise the goal, a major programme for the development of health care services is necessary but not sufficient. Health is a function,not only of medical care, but of the overall integrated development of society - cultural, economic, educational, social and political. Health also depends on a number of supportive services - nutrition, improvement in environment and health education. During the next two decades, therefore, the following three programmes will have to be pursued simultaneously: (i) integrated overall development including family planning; (ii) improvement in nutrition, environment and health education; and (iii) the provision of adequate health care services for all and especially for the poor and underprivileged.

ICMR AIDED SYMPOSIA/SEMINARS/WORKSHOPS/CONFERENCES

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
Workshop on Hospital Infections with Special Reference to Gram Negative Bacilli.	March 26- April 1, 1981	Department of Microbiology, All India Institute of Medical Sciences, New Delhi.
Seminar on Deserts, Man and Health.	April 11-14,1981	SMS Medical College, Jaipur.
Symposium on Photophysical and Photochemical Process in Chemical and Biological Systems.	April 14-16, 1981	Mahabaleshwar (Indian Photobiology Society).
National Workshop on Appropriate Technology for Primary Health Care.	April 23-26, 1981	Indian Council of Medical Research, New Delhi.
Workshops on Recent Advances in the Field of Cytogenetics and Biochemical Genetic Disorders; Approaches and Methods of Early Intervention with Handicapped Infants and Children and their Families; and Prenatal Diagnosis - Place of Fetoscopy and Amniocentesis.	May 1-2, 1981	Department of Pediatrics Seth G.S. Medical College and KEM Hospital, Bombay
Guha Research Conference 1981.	May 15-20, 1981	University of Kashmir Srinagar, Kashmir.
National Symposium on Corneal Disasters.	September, 1981	Dr.Rajendra Prasad Centr for Ophthalmic Sciences New Delhi.

PROGRAMME OF SCIENTIFIC LECTURES AT THE INDIAN COUNCIL OF MEDICAL RESEARCH, NEW DELHI

Date	Topic	Speaker
2.4.1981	Genetic Disorders in Pediatrics	Dr. I.C. Verma, New Delhi.

COUNCIL'S TRAINING PROGRAMMES FOR 1981

Leprosy:

At the Central Jalma Institute for Leprosy, Agra:

Training course in Leprosy for medical officers: (February 15 to March 28, 1981, and August 31 to October 14, 1981).

Virology:

At the National Institute of Virology Pune:

(1) Diploma course in Medical Virology Poona University: (July, 1981).

(2) *Workshop on Japanese Encephalitis in India.

Endocrinology:

At the National Institute of Nutrition, Hyderabad:

Annual certificate course in Endocrinological Techniques and their Application: (August to September, 1981).

Nutrition:

At the National Institute of Nutrition, Hyderabad:

(1) Annual certificate course in Human Nutrition for teachers from Agricultural Universities: (June/July, 1981).

(2) M.Sc. (Applied Nutrition) course: (June 1, 1981 to February 28, 1982).

(3) Annual certificate course in Public Health Nutrition: (October/November, 1981).

(4) Annual certificate course in Nutrition: (December 1, 1981 to February 28, 1982).

Haematology:

At the Blood Group Reference Centre, Bombay:

(1) A certificate course in Blood Banking Technology and Basic Haematology for medical officers: (February 1 to March 15, 1981).

(2) Training course in Blood Banking Methodology for technicians: (May 12-26, 1981).

Mental Health:

At Bangalore, Chandigarh and Delhi:

Training course on Extension of Mental Health Services in the Community: (July, 13 - August 22, 1981).

Occupational Health:

At the National Institute of Occupational Health, Ahmedabad:

NIOH/WHO Training Course on Air Pollution and Health: (June, 1981).

Clinical Pharmacology:

*At the Department of Pharmacology, Seth G.S. Medical College, Bombay.

Biostatistics:

At the Institute for Research in Medical Statistics, New Delhi:

(1) Certificate course in Planning and Evaluation of Health Programmes: (April, 1981).

(2) Diploma course in Biostatistics: (September, 1981).

(3) Certificate course in Orientation to Biostatistics: (September, 1981).

(4) Certificate course in Statistical Techniques in Medical Research: (January, 1982).

Laboratory Animal Technology:

At the National Institute of Nutrition, Hyderabad:

(1) Laboratory Animal Supervisors Training Course: (January 2 to March 31, 1981).

(2) Laboratory Animal Technicians Training Course: (August 1 to September 30, 1981).

COURSES FOR TALENT SEARCH SCHEME FELLOWS

Cell-Biology and Cyto-Genetics:

At the Indian Institute of Science, Bangalore: (March, 1981).

Use of Radioisotopes in Medicine:

At the National Institute of Nutrition, Hyderabad: (July, 1981).

Immunological Techniques:

At the Central Jalma Institute for Leprosy, Agra: (November, 1981).

Haematological Techniques:

*At the Department of Pathology, Christian Medical College, Vellore.

Clinical Endocrinology:

*At the Institute for Research in Reproduction, Bombay.

* Dates to be announced later.

SOME ICMR PUBLICATIONS

	Price Rs.
Menus for Low-Cost Balanced Diets and School Lunch Programmes suitable for South India (1959), Third Edition 1977, Reprinted 1978	1.50
Menus for Low-Cost Balanced Diets and School Lunch Programmes suitable for North India (1959), Second Edition 1977	1.50
Nutrition for Mother and Child (1962), Third Edition 1978	4.50
Some Common Indian Recipes and Their Nutritive Value (1964), Fourth Edition 1977, Reprinted 1980	6.50
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Diet Atlas of India (1971)	8.00
Nutrition Atlas of India (1971)	10.50
Atlas of Histopathology of Liver: Hepatitis and Cirrhosis (1974)	10.00
Studies on Pre-School Children (1974), Reprinted 1977	3.50
Studies on Weaning and Supplementary Foods (1974), Reprinted 1977	4.00
Medicinal Plants of India Vol. I (1976)	30.00
Research in Malaria - An Outline (1977)	Gratis
Health Hazards of Mycotoxins in India (1978)	5.00
Japanese Encephalitis in India, Revised Edition 1980	5.00

These publications are available on prepayment of cost by cheque or postal order (postal charges will be extra) drawn in favour of the Director-General, Indian Council of Medical Research, New Delhi. Money orders are not acceptable. All correspondence in this regard should be addressed to the Chief, Division of Publication and Information, Indian Council of Medical Research, Post Box 4508, Ansari Nagar, New Delhi-110029.

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CLINICO-ENVIRONMENTAL PROFILE OF RESIDUAL PARALYTIC POLIOMYELITIS

Poliomyelitis has been almost eradicated in the developed countries due to improved standards of living and public health measures undertaken through epidemiological surveillance, systematic immunization and environmental sanitation programmes[1]. However, in the developing countries, poliomyelitis still continues to be one of the major health problems of the paediatric age group[2,3]. The morbidity rates in recent years have shown an increasing trend as reported by the Haffkine Institute, Bombay, and others[4-6]. Epidemiological studies relating to the age of onset and relevant environmental factors reveal that over the last couple of decades the change, if any, has been negligible.

Morbidity studies reported in the literature have been mostly based on hospital statistics. The rehabilitative techniques are based mostly on the clinical assessment without always taking into consideration the environment of the polio victims. The ultimate success of rehabilitation depends on how a disabled child adjusts to the environmental conditions. The role of environment, including the social component, has been increasingly recognised in relation to human development and rehabilitation[7]. In the wake of industrialization, urbanization and changing way of life, ecological alterations have influenced the environmental barriers and the adaptation problems in various morbid conditions[8]. The management and rehabilitative techniques which were mainly developed after World War II in developed countries, have been applied to the post-polio residual disabilities without considering the Indian way of life. It is not uncommon, therefore, to find that surgical intervention undertaken without assessing the functional utility and environmental needs, leads to an entity of 'modified handicaps'. Rehabilitation of the disabled group has been given low priority in the national health plans. Rehabilitation services which are developed in India on a fragmentary basis, are mainly located in the cities[9]. The disabled group in the rural areas is, therefore, deprived of these services. Due to non-availability of the rehabilitative services polio affected children in rural areas continue with their disability for many years[10].

This situation needs to be changed drastically and on a priority basis. The rehabilitative programmes should be made more realistic and meaningful in their application to the rural population. An integrated multidisciplinary approach involving the concerned governmental departments and voluntary organisations in the field of medical and social sciences, has to be adopted so as to derive optimum benefits from available resources and of appropriate technologies to the beneficiaries. Clincio-environmental and socio-cultural assessment of the polio victims is essential to identify the functional needs and possible barriers in the management of paralytic poliomyelitis under home settings.

Division of Publication & Information, ICMR, New Delhi-110 029

This would also minimise the post-operative adjustment problems.

Study Population

A rehabilitation project for the orthopaedically disabled children was launched by the Hastimal Sancheti Memorial Trust, Pune - a voluntary organisation. Diagnostic camps were conducted in the rural areas of the State of Maharashtra and 5554 subjects in the paediatric age group,belonging to 4236 villages from 17 districts were selected for the study. Before subjecting them for specific rehabilitation, a clinico-environmental assessment was done of all these cases of post-polio paralysis.

Demographic Aspects

Earlier reports of various workers[11,12], before the introduction of oral Sabin's vaccine, had shown that almost 80 to 90 per cent of the cases occurred before the child reached 3 years of age. Although, after independence, health care and immunization programmes have been developed in the rural areas through Primary Health Centre complexes, there appears to have occurred only a negligible change in the incidence of polio cases. Further, the recent studies by Chodankar and Dave[4] have shown that during epidemic and interepidemic periods in every successive year, the polio prevalence has shown a trend to increase.

The present study has shown that the age of onset in 87.2 per cent of the cases was below 3 years, indicating that in rural Maharashtra there has been a negligible change in the host-environment relationship and no change in the age of onset.

A preponderance of males (66.4 per cent) was found in this study, as reported by other workers[2,4,13,14]. Social factors such as poverty have been commonly blamed for non-utilization of treatment facilities. Analysis of the socio-economic status of the families of the polio affected children showed that the per capita monthly income of 89 per cent families was below Rs.69/-.

Poor immunisation status of polio affected children has been reported by various workers. The poor coverage of 12.9 per cent for polio immunisation in the present study, indicated a low level of herd immunity, thereby exposing infants and children below 3 years to the risk of infection.

Clinical Profile

Role of Provocating Factors:

Precipitating factors such as trauma, lack of rest, massage and injections during the pre-paralytic stage of poliomyelitis are known for their deleterious effects in extending the paralysis. In the present study history of injection during the acute stage was available in 66.5 per cent cases, massage in 29.6 per cent and fomentation in 20.7 per cent.

Site of Affection:

The reported percentage of various workers[7,13,14],of affection of the lower limbs has ranged between 85 and 90 per cent. Similar findings were obtained in this study. Lower extremity was involved in nearly 91 per cent cases, while bilateral affection was present in 17.7 per cent. Upper extremity affection was observed in 8.77 per cent. Severe paralysis involving all the four extremities was observed in nine cases.

Muscle Affection and Spectrum of Deformities:

In the present series 59.3 per cent of the cases had associated deformities in the form of soft tissue contractures leading to joint and bone deformities. Multiple joint involvement with deformity was observed in 16.6 per cent of cases. Isolated foot deformities were present in 25.6 per cent of cases (Table). Primary spinal deformity was encountered in only 37 cases.

Deformity associated with paralytic poliomyelitis always starts in the soft tissues. The loss of elasticity, deposition of collagen, and conversion of collagen into fibrous tissue leads to deformity. These changes in the soft tissues occur too soon and to rapidly to be caused by disuse or adaptation. The distribution of the changes is unrelated to paralysis except in cases where deformity is consequent to muscle imbalance. Abnormal postures, lack of passive movements, and stretching in the acute stage leads to shortening of fascial structures[15].

The present series showed that 73.9 per cent of the isolated hip deformities had fixed flexion, abduction and external rotation due to contractures of the iliotibial band and abductors. In some cases there was also contracture of the associated flexors of the hip. Paralytic dislocation of the hip was observed in 5 cases.

Table: SITES OF DEFORMITY IN POLIO AFFECTED CASES

	Deformity of	Right	Left	Bilateral	Total	
1.	Hip	87	120	57	264	(4.8%)
2.	Knee	106	134	42	282	(5.1%)
3.	Foot	605	634	183	1422	(25.6%)
4.	Hip + Knee	173	205	180	558	(10.0%)
5.	Knee + Foot	47	48	20	115	(2.1%)
6.	Hip + Knee + Foot	93	86	71	250	(4.5%)
7.	Shoulder	158	174	4	336	(6.0%)
8.	Spine	-	-	-	37	(0.7%)
9.	Miscellaneous	-	-	-	29	(0.5%)
10.	No deformity	-	-	-	2261	(40.7%)
	Total	1269 (22.85%)	1401 (25.22%)	557 (10.03%)	5554	

Affection of both or single group of hamstrings gave rise to knee contracture in 40.4 per cent of the cases. Genu recurvatum due to quadriceps paralysis or stretched posterior structures of the knee was the commonest knee deformity and was seen in 59.6 per cent of cases.

Isolated foot deformity was present in 1422 cases. Equinus deformity and its variants, *i.e.* equino-varus, valgus, cavus and cavo-varus were the commonly encountered deformities in 46.61 per cent of cases. Calcaneous deformity and its variants were observed in 4.9 per cent. Miscellaneous deformities of foot and deformities of the great toe were encountered in 1.1 per cent of cases.

Iliotibial band contractures giving rise to combined hip and knee deformities of flexion, abduction and external rotation were observed in 60.1 per cent cases. In 30.8 per cent of the cases with flexion, abduction and external rotation deformity at the hip joint, there was also genu recurvatum due to quadriceps paralysis.

Genu recurvatum with equinus due to quadriceps paralysis was observed in 24 cases. Knee contractures with secondary equinus deformity of the foot was present in 31.3 per cent of cases. Flexion, abduction and external rotation at the hip, flexion with or without associated valgus at the knee with equinus at the ankle in 76.8 per cent cases, were due to iliotibial band contracture; and the equinus was due to postural or compensatory contracture of the tendo-achilles. Flexion contracture in the hip, recurvatum in the knee and equinus at the ankle were present in 12.8 per cent cases of quadriceps paralysis.

The soft tissue contractures in poliomyelitis are mainly due to deposition of collagen[15,16]. The mechanisms of deformities are mainly three *viz.* postural deformities, compensatory deformities and deformities due to muscle imbalance. The common hip and knee deformities, isolated or combined with each other and foot deformities are due to presence of predilection zones in the hip, thigh, knee and leg. These are bands of fascial thickenings strategically located wherein deposition of collagen produces the characteristic deformities in poliomyelitis[16].

Various studies have been conducted to show the spectrum of deformities in polio victims[13-15]. However, a large scale study (5554 cases) with isolated and combined pattern of deformities has not been described so far. Such a study would be helpful in determining the priorities for developing surgical rehabilitation services at the peri-

pheral and intermediate levels. Assessment of workload of orthotic appliances can be found out by further categorization of the beneficiaries.

The various types of deformities seen in this study were unattended for an average duration of 7.2 years. The study revealed that children between 10 to 15 years of age were exposed to various adverse environmental conditions. Post-polio residual deformities were postural, compensatory or due to muscle imbalance rather than due to any environmental influences.

Education, Recreational and Social Experiences of Polio Affected Children

During the formative age of the child, educational, recreational and social opportunities contribute towards the development of his personality. Polio victims can function as useful members of society provided that they get timely facilities of rehabilitation and opportunities for socio-psychological development. Study on educational activity revealed that 79.3 per cent of the polio children were attending school independently. Further, the educational performance of 59.5 per cent of them was above average indicating that the disability had minimal impact on the educational performance. The literacy rate of 61.4 per cent in the present series is comparable to the reported figures for children in 5 to 16 years age group. Alongwith educational activities, extra-curricular activities also form an important aspect of the social development of the child. Participation in extra-curricular activities with normal children creates new avenues for physical and social adjustment. Deprivation of such opportunities may lead to psychological disturbances. In this study, 46.58 per cent of the disabled children participated in extra-curricular activities like sports, music, handicrafts and others. This indicates that the desire to develop social contacts was not lacking.

In 53.42 per cent of the children who could not participate, it was necessary to explore the existing barriers at the individual and school levels. It was observed that 56.35 per cent of school-going children did not get recreational facilities to suit their disabilities. Disability that interfers with mobility is likely to minimise the opportunities for developing social contacts.

Children below 15 years who form 42 per cent of the total population, constitute major bulk of the morbidity. Recent concepts of social paediatrics lay greater emphasis on providing healthy physical and social environment to develop the personality of the child[17]. Provision of equal educational opportunity and social contacts to disabled children will help in integrating them to social spheres of life.

Exploration of delayed awareness about rehabilitation of disabled children or lack of parental motivation to avail of right type of treatment has been highlighted in this study. Ignorance is the main factor responsible for non-utilisation of medical services, more so in the rural areas, as was seen in 82.9 per cent of the children. Although poverty is commonly blamed, in this study it was attributed as the reason for non-utilization only by 11.2 per cent. Ignorance was the most important cause and it needs to be tackled by education as an integral component of rehabilitative services.

Socio-psychological Impact of Disability

The damage caused by chronic disabling diseases has serious consequences on the life and the development of personality of a child. Failure to adjust with the surrounding is manifested many times as a psychoemotional problem. Study on the reaction and personality development of the orthopaedically disabled children revealed that 45.9 per cent of the children were cooperative. Further, inquisitive nature, and desire to mix with friends was observed in 40.96 and 4.43 per cent of the children respectively. This could act as a catalyst in social rehabilitation.

The disabled children should be helped to accept their physical disability in a realistic manner so as to overcome the adverse effects of disability to the maximum possible extent. Sometimes, a disabled person fails to face the hard fact of physical disability and becomes oversensitive. This makes his social integration considerably difficult, because people find it hard to establish normal relations with him and try to avoid his company as far as possible[10].

Physically disabled children may become constant sources of worry and economic strain on the family. Lack of understanding on the part of the parents, indifferent attitudes,

and over or under protection may lead to many social adjustment problems in a disabled child - more so if the child is from a nuclear family[18].

Personality Development and Parental Attitude

Development of a child's personality depends upon the love and affection given by the parents. Social behaviour and culture of the family members also influence the personality of the child. Helpful and cooperative attitudes on the part of parents, help in adjusting the children to different adverse situations. In the opinion of 13.2 per cent of the parents, dependency of children with paralysis of both lower limbs was their main liability, while in 85 per cent of the parents whose children had unilateral lower limb paralysis, the main worry was for the future. Such parental attitudes could be effectively used in seeking their participation in the rehabilitation of the child.

Parental attitudes towards the morbidity influences the prognosis of the disabled children. Understanding of the disease can influence the rehabilitation plans. In this study, 86 per cent of the parents had a realistic attitude regarding the aetiology of the disease, whereas 8.7 per cent of the parents had resigned themselves to Fate or the mercy of God and other occult and supernatural forces. Consultations sought from allopathic doctors was found to be on the increase. A large number of the population had realistic views about the nature of the illness and an awareness that could help in promoting the process of rehabilitation of polio affected children.

Pity and sympathy shown by non-disabled persons act, in the long run, as barriers by depriving opportunities for social integration[19,20]. An educated and self-respecting disabled person strongly resents pity. Favourable attitude from the social integration viewpoint was noticed in 89.6 per cent school teachers and 41.1 per cent of the schoolmates of the school-going polio affected children.

Social Integration - New Perspectives

Social integration of the disabled implies their free and full participation in the main stream of community affairs. The rights and responsibilities should be shared equally with the non-disabled persons. Complete integration of the disabled into the society should be the ultimate goal of all rehabilitative services. The physical disability of the disabled is not the only factor that contributes to their social segregation. The main hurdles in the path of their social and cultural integration are the many prejudices or misconceptions widely prevalent in the general public regarding the disabled. These misconceptions or prejudices against the disabled are due to ignorance of the needs, problems, capacities and abilities of the disabled. This accounts for unrealistic attitudes towards, misconceived notions about and a lack of sympathetic understanding of disabled people on the part of the society. In order to restore the self-respect of disabled individuals one has to focus attention on the residual and potential abilities, rather than harping upon their disabilities. Every physically disabled individual has his own peculiar life style. No mass formula can, therefore, be applied in the field of rehabilitation. While promoting his potential ability one should not, however, ignore his permanent disability. In addition to the social barriers, some undesirable psychological reactions on the part of majority of people towards the disabled also greatly complicate their social and cultural integration. These reactions are frequently manifested as pity, fear, repungance, anxiety *etc.* These need to be overcome on a war footing.

Due to lack of adequate data on the problems and capacities of the disabled and poor dissemination of the available information, the general public remains almost totally ignorant of the needs, problems and capacities of the disabled. It is often erroneously assumed that disability is synonymous with intellectual inferiority, occupational handicap and emotional instability. Parallel steps therefore need to be taken to educate the community to absorb the polio affected children.

Physical Environment

An appraisal of physical conditions at home and school, before surgery, is necessary to minimise the problems of environmental maladjustibility[5]. While fabricating calipers the squatting position required for performing various physical activities should be considered. Many a time physical conditions or the physical rehabilitation measures may not provide a feasible solution to the problems faced by the patients and their parents. Hence judicious balance between accessibility action

and benefits of surgery needs to be ensured.

Adverse physical conditions such as the presence of parapet and uneven floor in the house were observed in 82.16 per cent of the cases in the present series. The appliances should be subjected to modification taking into account these adverse conditions, so as to encourage their regular use. At the entrance, the school had steps without bannisters in 74.35 per cent of the cases. This physical set-up should be considered for accessibility action. A study of the sitting arrangement in the school revealed that 57.9 per cent of the children had to sit on the floor. The domestic and social demands of the rural population render the conventional caliper a cumbersome rather than a useful device. If calipers are to be advised to some of these children, priority should be given for research in the biomechanical aspects of orthotic appliances. A pilot study is in progress on patients fitted with the modified above knee calipers. General outline of the caliper is similar to the conventional one. The joint, however, has been modified to allow flexion up to 136°. The ring lock operates in full extension. The feasibility of increased knee flexion for performing activities like squatting and sitting cross-legged is being assessed.

Despite the fact that various long-standing deformities were present, there appeared to be a minimal affection of the daily activities like schooling, toilet, dressing *etc.* in 80.54 per cent of 3970 cases in the present study. Majority of the children with upper limb affection could perform all daily activities. The main factor was unilateral affection and possibly taking over of the function by the unaffected extremity. Although the gait was affected in 95.39 per cent of the children, the remarkable ability to take over the function of the affected part by the normal counterpart is also greatly influenced by the environmental factors.

Changing Concepts of Surgical Rehabilitation with Wholistic Approach

Rehabilitation medicine which was evolved after World War II has undergone considerable growth and development during the last decade. The multidisciplinary approach has emphasised involvement and integration of various specialities, for rendering maximum benefits of medical rehabilitative techniques and social integration of the disabled person by creating a community awareness. The main aim of surgical rehabilitation is to detect the deformities at an early stage and provide adequate specialised services at a reasonable cost to the disabled community members. One of the aims of surgical rehabilitation is to improve the functional utility of the affected part. Success is largely dependant on the selection of the case, identification of abilities, stage at which the surgical intervention is done and post-operative environmental adjustment. Recently greater emphasis has been laid on the environmental factors rather than the personal factor while assessing the rehabilitation programme. The surgical rehabilitative techniques and orthotic appliances are constantly being reviewed and evaluated to suit environmental settings and way of life, realizing that the conventional orthotic appliances may not be often suitable for existing environmental conditions. Surgical intervention without consideration of these factors leads to the entity of 'modified surgical handicap'. All beneficiaries were evaluated, therefore, in this study from the clinico-environmental point of view, in order to improve the chances of functional utility of surgical rehabilitation.

Surgery in the form of correction of soft tissue contractures, bone or joint deformities was beneficial to nearly 44 per cent of children; 61.4 per cent of children required orthotics - some right away (30.3 per cent) and some following surgery (31.4 per cent) for facilitation of gait or stablisation of joints. In 25.6 per cent patients physiotherapy improved muscle power or corrected mild degrees of joint deformities, and thereby improved the function of the affected part.

Research in Surgical Rehabilitation

Critical evaluation and suitable alterations in the existing rehabilitation techniques are necessary with a view to promote the daily activities of life. Early recognition of the deformity has frequently provided an opportunity for correction of the defect. The approach should also envisage application of modern techniques for readjusting and resetting the handicapped group at whatever stage the disability develops. The result of these rehabilitative techniques depend upon case selection, degree of deformity and functional utility. Research activities should be directed to find new surgical procedures or modifications of the existing methods suited to environmental needs and also to know whether the results of surgery are better, if cases are selected in early stages. The appliances used are often unsuitable to the

needs of the local conditions. Modifications in terms of change of material, mechanism, *etc.* offer a challenge in orthopaedic research.

Evaluation of the utility of modified technique of immobilisation post-operatively by groin-to-toe cast and early spinal exercises in 28 cases with post-polio hip and knee contracture, has been done. Prolonged hospital stay and cost of treatment usually discourage parents from accepting surgical intervention by conventional hip spica immobilisation. They also face transportation problems, and difficulties in nursing at home. The modified technique by providing early rehabilitation has solved, to a large extent, these problems faced by parents. The initial results are encouraging enough to prompt a trial of this method as a new approach towards early rehabilitation of post-polio contracture cases coming from rural areas.

Various alternative approaches have been suggested for strengthening of primary health care. The present study has pointed out that development of new techniques or modifications in the surgical procedures, should be considered on the following lines: (i) Assessment of degree of deformity in terms of function, movement and coordination of muscles and joints; (ii) appraisal of affection of daily activity; (iii) feasibility of surgery and follow up at the district or sub-district levels, *viz.* civil hospital and cottage hospitals; (iv) the reduction of hospital recumbency to minimise socio-economic burden on the family; and (v) functional utility to meet the environmental needs and life style.

The study has also shown that: (i) Clinico-environmental assessment helps in minimising post-operative rehabilitation problems; (ii) there is a need of developing comprehensive parameters based on clinico-environmental assessment for surgical intervention; (iii) many promoting factors at individual and family level of the polio affected children need to be given priority in social integration; and (iv) there is need for social action to create a community awareness and a conducive environment.

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Contributed by: Dr. K.H. Sancheti, Dr. B.G. Sahasrabudhe, Dr. R.K. Bhingare and Dr. J.T. Electricwala, Hastimal Sancheti Memorial Trust Centre for Orthopaedically Handicapped Children, Pune.

ABSTRACTS

A National Workshop on Appropriate Technology for Primary Health Care was held between April 23-26,1981,at the Indian Council of Medical Research, New Delhi. The abstracts of papers presented on Rehabilitation in Primary Health Care in Session I of this Workshop are presented here.

Nature and magnitude of problems of the handicapped

India is the second largest developing country in the world with a population of over six hundred million people. A little over eighty per cent of the population lives in villages where reliable statistics are difficult to come by. This is one reason why estimates of the physically handicapped vary from 13 million to 60 million.

Increase in population, rising incidence of poliomyelitis, collagen diseases, hemiplegia, paraplegia and accidents-industrial, agricultural and vehicular, contribute to the ever increasing number of disabled in the country.

The available facilities are grossly inadequate in urban areas and are practically non-existent in rural areas. The existing facilities hardly manage to cover 15 per cent of the population and are unequally located in the country. The eastern part comprising Assam, Meghalaya, Arunachal Pradesh, Nagaland and Tripura, have no facilities at all while western and southern parts have relatively more facilities to look after the handicapped.

S.K. Varma
Department of Rehabilitation and Artificial Limbs
All India Institute of Medical Sciences
New Delhi.

Aids for the handicapped

Though the rehabilitation programme for the orthopaedically handicapped has gained momentum during the last 10 years, unfortunately the existing facilities are meagre and a large section of the disabled, especially the rural group is still not covered with specific programmes pertaining to their physical, psychological, social and vocational needs.

The All India Institute of Physical Medicine and Rehabilitation,Bombay,during the last 25 years has aimed at identifying the problems of the handicapped and has defined the applicability of rehabilitation philosophy to the health care programme. The Institute has developed various designs and materials needed for the aids of the handicapped specifically for the rural disabled.

In the field of orthosis, various plastic materials like polypropylene, polyvinyl, ABS, nylon fibre glass, reinforced polyester resins *etc.* are used for various components. A

umber of orthotic designs such as total con-act foot supports, shoe-less orthosis, double xis foot orthosis, heel-toe action substi-utes have been developed. Similarly, pro-hesis permitting squatting, immediate fitting rosthesis have also been introduced.

A.K. Mukherjee
M.G. Mokashi
All India Institute of
Physical Medicine and
Rehabilitation
Bombay.

ppropriate technology in rehabilitation aids

In the Department of Orthopaedics at SMS Medical College, Jaipur, formally train-ed prosthetists were utilized for fabricating .rtifical limbs based on western technology. 'atients often discarded these limbs and went back to crutches because the designs did not suit the Indian patients. A western limb could not be used without shoes and did not allow the amputee to squat or sit cross-legged on the floor. Desirable objectives and radical design changes were listed. The for-mally trained limb-maker was quite incapable of innovations. A craft-instructor who taught traumatic paraplegics 'some traditional crafts for self-employment' showed how the desired product could be made simple. As a result of this experience, the skills of local artisans were utilised, and a whole series of new designs for artificial limbs and calipers for polio cases were evolved. Two types of work-shops are run and monitored in the same Department - one using sophisticated, high cost, technology and manned by formally educated prosthetists and orthotists, and the other using a simple, low cost technology and manned by local artisans.

With over 5000 amputees who have been fitted with artificial limbs made by our traditional craftsmen, it has been shown that in developing and underdeveloped countries, the use of local artisans and simple, low-level technology can be utilized extremely effectively to provide rehabilitation aids to our widely scattered, economically deprived rural population. It is emphasized that these aids are not primitive substitutes for modern appliances. The ideas incorporated in these designs are sophisticated and can stand comparison with those used in the west. Certain problems were faced in developing this model.

P.K. Sethi
Department of Orthopaedics
SMS Medical College
Jaipur.

SUMMARY OF LECTURE DELIVERED AT THE ICMR, NEW DELHI

Genetic Disorders in Pediatrics by Dr. I.C. Verma, Associate Professor, Department of Pediatrics, All India Institute of Medical Sciences, New Delhi, on April 2, 1981.

Infections and malnutrition are at present significant causes of morbidity and mortality in children in India, in contrast to developed countries where genetic disorders predominate. However, an analysis of births at AIIMS Hospital showed that congenital mal-formations exceeded infections as causes of perinatal mortality. This presages the trend that is likely to appear in the near future in India.

Studies on prevalence of genetic dis-orders in India carried out at Department of Pediatrics, AIIMS, and at other centres in India indicate that about 1.5 million children are born every year with genetic disorders, and that about 83 million people suffer from central nervous system disorders and late on-set multifactorial disorders in which genetics play a significant role.

The pattern of congenital malformation in various parts of India is known. Neural tube defects predominate in north India, while the etiology of this disorder still eludes scientists, techniques such as ultra sound and alpha fetoprotein assay in maternal serum and amniotic fluid have been established at the AIIMS for helping families with this disorder.

Studies in the Genetics Laboratory, AIIMS, have determined the distribution of maternal age in the causation of Down's syndrome; only 35 per cent of cases were born to mothers aged 35 years or more. The incidence of trans-location type Down's syndrome in young mothers in India is 6.2 per cent. The higher incidence of Down's syndrome in uncle-neice marriages (possibly due to a paternal age effect) needs to be verified. The high incidence of Down's syndrome in areas in Kerala with increased

background radiation due to monazite in the soil was recognized by studies by this laboratory.

Studies of HLA antigens in common disorder such as Indian childhood cirrhosis, tuberculosis and tuberculosis maningitis, leprosy and spina bifida, and in parents of Down's syndrome children are being pursued vigorously to determine genetic component of these disorders.

The approaches for reducing the burden of genetic disease in the Indian population were discussed. The urgent need to set up regional genetic centres, statewise genetic centres, mobile genetic clinics, screening of high risk populations for genetic disease, and preparation of aids for genetic counselling of individuals with little or no formal education was highlighted.

ICMR NEWS

The following ICMR Expert Groups/Task Forces met at the Council during the month:

Task Force on Hypertension	May 4, 1981
ICMR Toxicology Review Panel	May 12, 1981
Task Force on Japanese Encephalitis Vaccine	May 20-21, 1981
Task Force on Infertility	May 21-22, 1981
Expert Group on Health Services Research	May 22-24, 1981

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Dr. S. Sriramachari, Director, Institute of Pathology, New Delhi, delivered a lecture on 'Advances in Medical Education and Technology in Continuing Medical Education' at the Conference on 'Health for All by 2000 and Medical Education', held at Manipal on April 29-30, 1981.

Dr. R. Krishnamachari, Research Officer, National Institute of Nutrition, Hyderabad, participated in an International Symposium on 'Trace Element Metabolism in Man and Animals' at Perth, Australia, between May 11-15, 1981.

Dr. V. Ramalingaswami, Director-General, ICMR, inaugurated the National Seminar on 'Deserts, Man and Health', at Jaipur on May 30, 1981.

ICMR AIDED SYMPOSIA/SEMINARS/WORKSHOPS/CONFERENCES

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
Workshops on Recent Advances in the Field of Cytogenetics and Biochemical Genetic Disorders; Approaches and Methods of Early Intervention with Handicapped Infants and Children and their Families; and Prenatal Diagnosis - Place of Fetoscopy and Amniocentesis.	May 1-2, 1981	Department of Pediatrics, Seth G.S. Medical College and KEM Hospital, Bombay.
Guha Research Conference 1981.	May 15-20, 1981	University of Kashmir, Srinagar, Kashmir.
Seminar on Deserts, Man and Health.	May 30, 1981	SMS Medical College, Jaipur.
National Symposium on Corneal Disasters.	September, 1981	Dr.Rajendra Prasad Centre for Ophthalmic Sciences, New Delhi.

ympo sium/ Seminar/ Workshop/ onference	Date	Institution/Department
th All India Congress of Cytology nd Genetics, 1981	October 17-21, 1981	University of Bhagalpur, Bhagalpur.

COUNCIL'S TRAINING PROGRAMMES FOR 1981

eprosy:

At the Central Jalma Institute for Leprosy, Agra:

Training course in Leprosy for medical officers: (February 15 to March 28, 1981, and August 31 to October 14, 1981).

/irology:

At the National Institute of Virology, Pune:

(1) Diploma course in Medical Virology of Poona University: (July, 1981).

(2) *Workshop on Japanese Encephalitis in India.

ndocrinology:

At the National Institute of Nutrition, Hyderabad:

Annual certificate course in Endocrinological Techniques and their Application: (August to September, 1981).

Nutrition:

At the National Institute of Nutrition, Hyderabad:

(1) Annual certificate course in Human Nutrition for teachers from Agricultural Universities: (June/July, 1981).

(2) M.Sc. (Applied Nutrition) course: (June 1, 1981 to February 28, 1982).

(3) Annual certificate course in Public Health Nutrition: (October/November, 1981).

(4) Annual certificate course in Nutrition: (December 1, 1981 to February 28, 1982).

Haematology:

At the Blood Group Reference Centre, Bombay:

(1) A certificate course in Blood Banking Technology and Basic Haematology for medical officers: (February 1 to March 15, 1981).

(2) Training course in Blood Banking Methodology for technicians: (May 12-26, 1981).

Mental Health:

At Bangalore, Chandigarh and Delhi:

Training course on Extension of Mental Health Services in the Community: (July, 13 - August 22, 1981).

Occupational Health:

At the National Institute of Occupational Health, Ahmedabad:

NIOH/WHO Training Course on Air Pollution and Health: (June, 1981).

Clinical Pharmacology:

*At the Department of Pharmacology, Seth G.S. Medical College, Bombay.

Biostatistics:

At the Institute for Research in Medical Statistics, New Delhi:

(1) Certificate course in Planning and Evaluation of Health Programmes: (April, 1981).

(2) Diploma course in Biostatistics: (September, 1981).

(3) Certificate course in Orientation to Biostatistics: (September, 1981).

(4) Certificate course in Statistical Techniques in Medical Research: (January, 1982).

Laboratory Animal Technology:

At the National Institute of Nutrition, Hyderabad:

(1) Laboratory Animal Supervisors Training Course: (January 2 to March 31, 1981).

(2) Laboratory Animal Technicians Training Course: (August 1 to September 30, 1981).

COURSES FOR TALENT SEARCH SCHEME FELLOWS

Cell-Biology and Cyto-Genetics:

At the Indian Institute of Science, Bangalore: (March, 1981).

Use of Radioisotopes in Medicine:

At the National Institute of Nutrition, Hyderabad: (July, 1981).

Immunological Techniques:

At the Central Jalma Institute for Leprosy, Agra: (November, 1981).

Haematological Techniques:

*At the Department of Pathology, Christian Medical College, Vellore.

Clinical Endocrinology:

*At the Institute for Research in Reproduction, Bombay.

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* Dates to be announced later.

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ICMR BULLETIN

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NATIONAL WORKSHOP ON APPROPRIATE TECHNOLOGY FOR PRIMARY HEALTH CARE

A National Workshop on Appropriate Technology for Primary Health Care was held at the Indian Council of Medical Research, New Delhi, between April 23-26, 1981. The abstracts of some papers presented at various sessions of this Workshop are presented here

MEDICAL CARE COMPONENT OF PRIMARY HEALTH CARE

In her paper on "Domiciliary Treatment in Primary Health Care", Dr. Mabel Arole (Comprehensive Rural Health Project, Jamkhed, Ahmednagar) said that domiciliary treatment forms an important component of primary health care and is an important tool in the hands of the Community Health Volunteer (CHV) and Multipurpose Worker (MPW) to gain the confidence of the community so as to be able to carry out their preventive and promotive health programmes.

The CHVs play a major role in domiciliary treatment as they can treat most of the common childhood illnesses such as diarrhoea, respiratory infections, skin diseases *etc*. Normal deliveries and symptomatic treatment of minor illnesses in adults are also within the scope of CHV. Chronic diseases such as tuberculosis, leprosy and acute illnesses once diagnosed by a doctor can be followed up at home by CHV or MPW. However, it is important to make the health workers understand their limitations and proper guidelines should be given for upward referral.

While presenting Dr.R.S.Arole's(Director, Comprehensive Rural Health Project, Jamkhed, Ahmednagar) paper on "Management of Emergencies in Primary Health Care", Dr. Mabel Arole said that first aid and management of emergencies should be taught to responsible groups such as *Mahila Mandals*, farmers clubs *etc*. The teaching should be practical and relevant to the needs of the community *e.g.* the management of snake bites, injuries, deliveries *etc*. The need to develop an appropriate system of communication and for quick transportation of patients was also stressed by her. At present bicycles and bullock-carts are the only available means of transport in many areas. Appropriate modifications should be made in these so as to make the patient's journey safe and comfortable.

Dr. L.M. Nath (Professor, Centre for Community Medicine, All India Institute of Medical Sciences, New Delhi), in his paper on "Supportive Facilities for Primary Health Care" was of the view that if the commitment of Health for All by 2000 A.D. is to be met, it would be necessary to establish a suitable chain of health care services concentrating heavily on the preventive aspects and on the non-physician health worker at the periphery.

Studies at the Ballabgarh block have shown that trained workers handled'correctly', 86.3 per cent of the cases seen by them. However,it was seen that the trained para-medical workers could function competently only if they received complete support from the health services system not only in terms of training, supervision and timely provision of material, but also technical support

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in the management of their cases. Trained workers referred 6.5 per cent of all the cases encountered by them. In order to enhance the credibility of the health worker and provide adequate health services, it would be necessary, he said, to provide supportive services for the management of referred cases. Though software support in terms of consultant and specialist services have often been emphasised, less concern has been shown for the requirements of physical and investigative facilities.

Dr. R.N. Khandpur (Head, Medical Electronic Instruments Division, Central Scientific Instruments Organization (CSIO), Chandigarh) in his paper on "Appropriate Technologies for Primary Health Care", presented the work done at CSIO. Sophisticated electronic equipment cannot often be used at the Primary Health Centres due to lack of electricity, irregular supply of reagents, damage due to inadequate training of operators, damage of components due to hostile environments, and the high cost. Medical equipment for PHCs must therefore be simple in design and operation, reliable and sturdy in construction, should need minimal maintenance and should be comparatively cheap. Running expenses should be low.

The CSIO has developed a cycle ambulance for use in the rural areas where motorised transport is not available. This ambulance has a stretcher for the patient along with a seat for an attendant, and is covered. To help the semi-literate health workers, a clinical thermometer with the temperature range depicted by coloured bands, has been developed. Some other instruments developed are: Vasec apparatus - a reliable, effective, durable, simple and inexpensive instrument for vasectomy procedures; foetal stethoscope which can detect the foetal heart beats as early as the twelfth week of gestation; mini cardioscope; and colorimeter.

In "Appropriate Technology in Dental Care" Dr.Amrit Tewari (Professor of Dentistry, Postgraduate Institute of Medical Education and Research, Chandigarh) stated that the prevalence of periodontal diseases is 90 to 95 per cent in children and 95 to 100 per cent in the adult population of this country. Two decades ago the prevalence of dental caries was quite low - about 37 per cent. In the recent past, it has increased in children. Today, 85-90 per cent children suffer from dental caries and by the time a child is 16 year old, five of his/her permanent molars are already decayed, she said. The dentist to population ratio in India is 1:80,000 and 80 per cent of the dentists are in the cities. In rural areas there is hardly any professional dental help available. In adults, the major problem is still periodontal disease but in children it is both gum diseases and dental caries.

This situation according to her, emphasises the urgent need for primary dental care which should be low cost and reach the community with the help of locally trained auxiliaries. The plan of action should include (i) dental health education to pregnant mothers for antenatal dental care as well as for the care of pre-school children; (ii) reinforcement of dental health education and preventive measures at 2 1/2 to 3 years of age, and the evaluation of interventions; (iii) preventive and curative programmes for school children; and (iv) emergency low cost, curative and preventive programmes for adults. This plan calls for developing and evaluating low-cost tools and procedures which are effective. Attention has also to be drawn to manpower development.

PRIMARY HEALTH CARE: ORGANISATION, RESOURCE MOBILISATION, TRADITIONAL MEDICINE

In his paper on "Resource Mobilisation for Primary Health Care", Dr. K.S. Sanjivi (The Voluntary Health Services Medical Centre, Adyar, Madras) expressed the view that the essential requirements for primary health care are (i) a health post manned by a lay first-aider for every 1000 population; (ii) a male and a female multi-purpose worker for every 5000 population; (iii) a doctor being available at the mini-centre for at least three hours a day on three days a week; and (iv) the identification of,and liaison with, a referral hospital within a reasonable distance.

Regarding cost of Mini Health Centres for Primary Health Care he felt that while the community provides free accommodation and furniture and a certain amount of money, the remainder should be shared by the State and Central Governments. He also felt that the services should not be entirely free but each family should make a token contribution.

Attention was drawn by him to the .lternative patterns for delivery of primary ;ealth care available in Tamil Nadu. These .nclude (i) a primary health centre with its ;ub-centres and provision under the minimum ;eeds programme; (ii) a primary health centre :ogether with the mobile medical unit as it ;xists in certain blocks; (iii) locally funded ;anchayat dispensaries; and (iv) entirely ;rivate efforts. A comparison of the resources ;eeded by way of money, materials and manpower ;nd the cost between these alternatives was ;lso presented.

He also explained how the recurring ex-;enditure could be shared between the Central ;overnment, State Government and the community itself.

Dr. K.N. Udupa (Rector, Institute of Medical Sciences, Banaras Hindu University, Varanasi) felt that indigenous systems of medicine can be utilised for preventive and curative aspects in Primary Health Care. Ayurveda, Yoga and Naturopathy are generally used for preventive and promotive care, whereas for the treatment of common illnesses Ayurvedic, Unani, Siddha and Homoeopathic systems of medicine may be used. Health education programmes about Ayurveda and Yoga will be of great benefit. Ayurveda lays stress on regularity of habits, seasonal adaptation of diet, sleep and other social activities. For promoting mental health and for the prevention of various psychosomatic disorders various yogic practices may be adopted. Yoga should be popularised not only amongst the students in schools and colleges, but also in the community, both in urban and rural areas. There are herbal remedies which are of great value for the treatment of common diseases and also for managing different chronic diseases.

Dr. Ashok B. Vaidya (Ciba Geigy Research Centre, Bombay) in his paper on "The Use of Scientifically Validated Herbs and Plants in Primary Health Care" said that herbs and plants have been used for therapy in India for thousands of years. However, there has not been any sustained and substantial effort to scientifically validate or refute the therapeutic claims. The experiments in animal models do not provide adequate data for extrapolation to man, he said. With clinical pharmacology methods coupled with phytochemical data, possibilities now exist for a proper scientific exploration. Dr. Vaidya felt that *Holarrhena antidysenterica, Mucuna pruriens, Picrorrhiza kurrooa, Berberis aristata, Cassia fistula, Plantago ovata, Zingiber officinale, Rubia cordifolia* and several other plants and herbs can be gainfully utilized in primary health care.

COMMUNICABLE DISEASE CONTROL AND COMMUNITY PARTICIPATION

Malaria, viral encephalitis, scabies, gastrointestinal infections and to a certain extent also filariasis, are the common vector borne diseases in rural areas said Dr. P.K. Rajagopalan (Director, Vector Control Research Centre, Pondicherry) in his paper on "Vector Control Operations in Rural Areas and Community Participation". Even before the DDT era, malaria was controlled in many places by the use of larvicidal fishes and environmental manipulation and with the failure of chemical insecticides, these methods are now again being used. The Vector Control Research Centre had taken up a scheme on the control of vectors in eight coastal villages with a population of 10000, without the use of chemicals and the results are encouraging. However, community participation was disappointing. One of the reasons for this was, perhaps, that health care was viewed in isolation. To be successful health care needs to be linked with socio-economic improvement, he said.

Dr. S.P. Tripathy (Director, Tuberculosis Research Centre, Madras) in his paper on "Appropriate Technology for Tuberculosis Control-Chemotherapeutic Regimes" stated that tuberculosis was a major public health problem in India with high morbidity and mortality. At present, there are approximately 8 million cases of pulmonary tuberculosis in India, of which, only about 1.5 million are residing in about 3000 towns and cities, while the remaining 6.5 million live in approximately 600,000 villages many of which have practically no health care facilities in the vicinity. If the tuberculosis control measures are to have any impact on the problem in the country, it is necessary that the control measures be directed towards the detection and treatment of tuberculosis cases in the rural areas, he said.

Studies at the Tuberculosis Research Centre have clearly demonstrated that domiciliary treatment of tuberculous patients on an ambulatory basis is as effective as treatment of the patients in a sanatorium. Domiciliary treatment is thus the appropriate technology for tuberculosis control. The treatment of tuberculous patients with several antituberculosis drugs like isoniazid, rifampicin,

streptomycin, ethambutol, thiacetazone, para-amino salicylic acid (PAS), ethionamide and pyrazinamide was discussed and various chemotherapeutic regimens with different combination of these drugs were explained by him.

It was suggested that the diagnosis and treatment of tuberculosis should be integrated with general health services at all levels. Domiciliary treatment offered from dispensaries near the patient's home is thus appropriate technology for the tuberculosis control and assures good regularity in treatment.

In his paper "Tuberculosis Control and Community Participation" Dr. G.D. Gothi (Director, The New Delhi Tuberculosis Centre, New Delhi) said that the social problems arising due to tuberculosis are no less important than the medical problems. It is essential to tackle the former with the fullest community participation. In the National Tuberculosis Programme (NTP), attention has been mostly concentrated on the problems of organisation and the operational aspects of providing a 'workable' service. The social aspect, and in particular, the question of involving voluntary social workers or of otherwise organising community participation, has not received adequate attention. Indeed, but for one or two exceptions, there are hardly any data regarding the feasibility of any specific scheme for community participation. Any discussion on this subject at this stage, therefore, has to be carried out without supporting statistical evidence, he said.

It appears reasonable to expect that a well motivated community worker can be of immense help in all facets of NTP, whether it is prevention, case-finding or case-holding. How much this adds to the utility of MPWs, should form a subject of research.

The only way of combating leprosy is to make the community highly conscious of the problem as well as its solution said Dr. K.V. Desikan (Director, Central Jalma Institute for Leprosy, Agra) in his paper on "Leprosy Control and Community Participation". Effective health education should help people recognise the disease in its early stages. The patient should be treated in a general hospital or by a general/private practitioner. Again by health education, unnecessary fears and unwarranted prejudices would be removed, so that the patient could remain in the society. Lastly, patients who have developed deformities should be rehabilitated in society, and not admitted to charity homes. All these require active community participation.

The National Leprosy Control Programme of the Government of India was designed with the above objectives in mind, he said. The programme is not institution oriented, but is meant to cover the population by health education, early recognition of cases, and treatment of all known cases with follow up of the patients and contacts at their homes. Over 30 lakhs out of the 35 lakhs estimated patients have been detected and brought under treatment. There is, however, room for improving the efficacy of its working. The programme is essentially based on community involvement and most of the work is being carried out in rural areas.

HEALTH MANPOWER FOR PRIMARY HEALTH CARE

While highlighting his experiences on "Training of Health Manpower for Primary Health Care" Dr. Y.L. Vasudeva (Professor of Social & Preventive Medicine, Medical College, Rohtak) emphasised the role of popular participation in primary health care. He said that the training of male and female leaders in camps, had been undertaken so as to make them initiators of community action. The training process for Community Health Volunteers dealt with the role they played, and had problem solving exercises and the like. Health education, practical training, first aid and field work were included in the training. Feed back on the training was encouraged as also the reciprocal trainer-trainee interaction. Problems such as disruption of ongoing health centre work, decline of interest of the trainers and the trainees were also brought out. He also described the training of unipurpose workers as multipurposes workers, which included practical, job specific and proficiency training. He felt that the training of medical students and interns should have a longer field exposure *e.g.* (i) 4 weeks entry period training, and (ii) 3 months rural internship training. The initial 4 weeks training should include exposure to the problems of want, disease, ignorance, squalor and idleness and their possible solutions through primary health care. This is an attempt to change the outlook and correct the disease centered approach present in the MBBS training. Data gathered during the four weeks period can be utilized for undergraduate training.

Rural internship - its objectives, scope, tasks and activities in relation to health care and its preventive, clinical and administrative aspects were enumerated.

Deficiencies in training and functioning f ANMs, multi-purpose workers and staff nurses ere highlighted. He concluded by recommending several priority areas for research in raining of manpower for Primary Health Care.

The Department of Community Medicine, ostgraduate Institute of Medical Education nd Research (PGI), Chandigarh, and the Primary ealth Centre at Raipur Rani, have developed ids to facilitate maternal and child health are in the rural areas. This information was resented by Dr. V. Kumar (Department of ommunity Medicine, PGI, Chandigarh) in his aper entitled "Appropriate Technology for the raining of Traditional Birth Attendants". hese aids/instruments have been developed rimarily for the use of Traditional Birth ttendants (TBA), who are generally illiterate.

Cheap, disposable 'Dai kits' have been roduced locally, which help in the prevention f neonatal tetanus because of better asepsis. igh risk women are recognised by measurement f their height range, using bamboo sticks ith colour coded symbols. Low birth weight nfants are identified using colour symbols on heap weighing scales. TBA keep records of arious events during pregnancy, child-birth nd the post-partum period, by using simple pictorial cards in which these events are epresented. Thus vital information is made vailable, 'high risk' individuals are identified and important tasks remembered. An illustrated, self instruction manual has been prepared for the use of Traditional Birth Attendants.

The appropriate technology aids which have been introduced are being evaluated for their relevance, cost, acceptability, logistics and impact on outcome parameters. It has also been possible to operationalise the use of these aids in the block.

Dr. L. Ramachandran (Director, The Gandhigram Institute of Rural Health and Family Welfare Trust, Ambathurai, Madurai District) viewed appropriate technology in the training of community health volunteers from three aspects *viz.* (i) appropriate functions to be performed; (ii) appropriate approaches for community involvement and participation; and (iii) appropriate training methods.

Two types of community health volunteers *viz.* the school teacher and educated volunteers - male and female, have been evaluated at the Gandhigram Institute; the village health guides for one year and the school teachers for more than two years. It was seen that they were able to diagnose minor conditions and dispense the correct medicines from the kits provided. It was also found that they could make proper referral of cases. According to Dr. Ramachandran, the training, should include information on (i) symptoms of common diseases so that diagnosis is possible from the history; (ii) home remedies and their uses; (iii) environmental sanitation - easy and practical methods for disposal of sullage and sewage; (iv) methods for provision of safe drinking water; (v) nutrition education; (vi) antenatal care; and (vii) family planning. The training should be staggered and essentially in the field.

ABSTRACTS

Some Research Projects completed recently

Metabolic role of phthalate esters in retinal vasculitis (Eales' disease)

In vivo and *in vitro* studies were carried ut with phthalate esters-dimethylphthalate DMP), diethylphthalate (DEP) and diethylexylphthalate (DHEP), to establish their etabolic role in retinal vasculitis (Eales' isease) in rabbits. To observe short-term *n vivo* effect of the esters, three doses 0.5 ml, 1.0 ml and 1.5 ml) of each ester were iven subcutaneously at 5 day intervals to hree different groups of rabbits (5/group). For studying long-term *in vivo* effect of these esters, 1.5 ml of each ester was injected *s.c.* at 5 day intervals for 3 months. A control group was maintained under normal conditions without any treatment. *In vitro* effect of these esters on aldolase activity was studied after thorough analysis of retinal homogenates. Short term *s.c.* injections of DHEP inhibited aldolase activity in retina, brain, kidney and liver of rabbits to an extent of 47 per cent, 60 per cent, 13 per cent and 58 per cent, whereas long-term administration of DEP and DMP led to 36 per cent, 54 per

cent, 10 per cent and 0 per cent, and 17 per cent, 49 per cent, 20 per cent and 13 per cent enzyme inhibition respectively in these organs in *in vivo* experiments. Interestingly, aldolase inhibition increased (to 62 per cent) at low concentrations of DMP and started decreasing (to 9 per cent) at higher concentration in *in vitro* studies.

The activities of succinic dehydrogenase (SDH) and lactic dehydrogenase (LDH) were inhibited in all the organs. Activity of ATPase remained unaltered in all the experiments.

S. Srimannaryana
K. Nath
Institute of Ophthalmology
Aligarh Muslim University
Aligarh.

Comparative studies on cytology and histochemistry of oogenesis in rabbits, guineapigs and mice

Employing cytological and histochemical tests an attempt was made to study the activity of cytoplasmic organelles and nuclear materials with respect to vitellogenesis in rabbits, guineapigs and mice. The chromatin particles were found to be arranged as halo in fine threads in mouse oocyte, whereas in guineapig and rabbit they were found to have thick reticular structure, thus reflecting variations in the compactness of axes and lateral loops of a lampbrush type organization in the three mammalian species. Several secondary nucleoli appeared during antral stage and were found moving across the nuclear membrane to the ooplasm in mouse, and to a lesser extent in rabbit. In guineapig oocyte, though the nucleoli were arranged along the nuclear membrane, no extrusion to the ooplasm was observed suggesting that the informational material in the form of RNA and protein is supplied to the ooplasm of all the three mammals.

Yolk nucleus was found to exist only in guineapig oocyte and participated in vitellogenesis. No such structure could be traced in mouse and rabbit oocyte.

Activity of Golgi bodies varied in the three mammalian oocytes at different stages of the maturation. Golgi bodies of peripheral zone of mature oocyte of mouse, guineapig and rabbit have been found to play important role in the formation of zona pellucida, cortical granules and in the synthesis of mucopolysaccharides, those of central ooplasm participated in general metabolism of the oocyte.

Mitochondria were found to play some role in elaboration of yolk in the oocytes of mouse and rabbit. The vacuoles were arranged peripherally to ooplasm in mouse oocyte, scattered in guineapig and rabbit and were thought to be

Lipid bodies with varying behaviour and distribution were detected in the three mammalian oocytes. Those of mouse and guineapig could be designated as L_1 and L_2 depending on their mode of distribution and dispersion in the ooplasm, whereas no differentiation could be made in lipid bodies of rabbit oocytes.

The histochemical analysis revealed the presence of histidine, tyrosine, arginine and $-NH_2$ groups - containing proteins in the proteid yolk of rabbit; tyrosine and $-NH_2$ groups in that of mouse, and histidine, tryptophan, tyrosine, arginine, -SH and $-NH_2$ groups in the proteid yolk of guineapig. The fatty yolk of mouse and rabbit was found to be an admixture of neutral fat and phospholipid while that of guineapig was composed of neutral fat only.

G.P. Verma
Department of Zoology
Bihar University
Muzaffarpur.

ICMR NEWS

Dr. Badri Saxena, Senior Deputy Director General, ICMR, New Delhi, and Dr. K. Prema, Assistant Director, National Institute of Nutrition, Hyderabad, attended a meeting on 'Comprehensive Studies on Lactation, Nutrition, Fertility and Interactions' at the National Institute of Health, Bethesda, USA, on June 1-3, 1981.

Dr. V. Ramalingaswami, Director General, ICMR, attended the meeting of the Board of Trustees of the International Centre for Diarrhoeal Diseases Research at Dacca, Bangladesh, between June 8-14, 1981.

Dr. Ramalingaswami also participated in the joint meeting of the Central Health

Council and Central Council of Family Welfare which was held between June 15-17, 1981 at Vigyan Bhavan, New Delhi.

Dr. S.K. Chatterjee, Director, National Institute of Occupational Health, Ahmedabad, participated in a WHO Study Group meeting on Health Based Occupational Exposure to Pesticides at Geneva between June 15-22, 1981.

Dr. Ramalingaswami participated in a symposium on the 'Rehabilitation of the Disabled' organised jointly by the Indian Federation of United Nations Associations and the India International Centre at New Delhi, on June 16, 1981.

Dr. N.P. Gupta, Senior Deputy Director General and Dr. S.V. Apte, Officer on Special Duty, ICMR, New Delhi, visited Moscow between June 20-30, 1981, preliminary to the launching of the collaborative programmes under an Indo-USSR agreement.

Dr. Ramalingaswami participated in the meeting of the Technical Committee for the Antifertility Research Programme of the Central Drug Research Institute, Lucknow, on June 26, 1981.

Dr. K.M. Pavri, Director, National Institute of Virology, Pune, took part in the Technical Review Meeting for Draft International Guidelines of Laboratory Safety held at Geneva between June 29-July 3, 1981.

ICMR AIDED SYMPOSIA/SEMINARS/WORKSHOPS/CONFERENCES FOR 1981

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
X National Conference on Communicable Diseases.	January 2-4, 1981	TN Medical College, Bombay (Indian Association for Communicable Diseases).
International Symposium on Lectins as Tools in Biology and Medicine.	January 7-9, 1981	Institute of Experimental Medicine, Calcutta.
Workshop on Contact Dermatitis.	January 7-10, 1981	MGM Medical College, Indore (Indian Association of Dermatologists, Venereologists and Leprologists).
Fifth National Symposium on Cryogenics.	January 9-11, 1981	Lucknow (Indian Cryogenics Council).
Workshop on Vitreous and Retinal Detachment Surgery and Symposium on Guidelines for Teaching and Research in Ophthalmology.	January 9-13, 1981	RNT Medical College, Udaipur (All India Ophthalmological Society).
Seminar on Postgraduate Medical Education - Training and Evaluation.	January 16-18, 1981	Osmania Medical College, Hyderabad (Indian Association for the Advancement of Medical Education).
Second Special Symposium on Natural Radiation Environment.	January 19-23, 1981	Bhabha Atomic Research Centre, Bombay (Indian Association for Radiation Protection).

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
XXXIII Annual Conference of the Association of Otolaryngologists of India.	January 21-24, 1981	Nalanda Medical College, Patna.
Sixth Annual Conference of the Environmental Mutagen Society.	January 27-29, 1981	Saha Institute of Nuclear Physics, Calcutta.
Workshop on Streptococcal Bacteriology and Immunology.	February, 1981	Department of Microbiology, Christian Medical College and Hospital, Vellore.
COGENE course on Recombinant DNA Techniques.	February 2-22, 1981	Department of Biochemistry, Institute of Medical Sciences, Banaras Hindu University, Varanasi.
National Seminar on Infections of Central Nervous System.	February 10-12, 1981	All India Institute of Medical Sciences, New Delhi (National Academy of Medical Sciences).
Symposium on Cancer of Cervix.	February 12, 1981	Tata Memorial Hospital, Bombay (Indian Association for Cancer Research).
Conference on Fifty Years of Electron Microscopy.	February 16-18, 1981	Indian Institute of Science, Bangalore (Electron Microscope Society of India).
Symposium on Chemotherapy and Immunology in the Control of Malaria, Filariasis and Leishmaniasis.	February 18-21, 1981	Central Drug Research Institute, Lucknow.
National Conference on Current Trends in Physical Medicine and Rehabilitation.	February 19-21, 1981	Medical College, Trivandrum (Indian Association of Physical Medicine and Rehabilitation).
National Seminar on Medical Negligence and Symposium on Medicolegal Aspects of Rape.	February 21-23, 1981	Gandhi Medical College, Hyderabad (Indian Academy of Forensic Medicine).
Symposium on Primary Health Care - World Strategy.	February 23-26, 1981	All India Institute of Hygiene & Public Health, Calcutta (World Federation of Public Health Associations).

ymposium/Seminar/Workshop/ onference	Date	Institution/Department
ymposium on Recent Advances in Hor- onal Contraception.	February 24, 1981	All India Institute of Medical Sciences, New Delhi. (Association of Obstetricians & Gynaecologists of Delhi).
ymposium on Cancer Chemotherapy.	February 27-28, 1981	K.G. Medical College, Lucknow (Indian Association of Cancer Chemotherapists).
eminar on Primary Health Care- orld Implementation Experiences.	February 28 - March 2, 1981	Institute of Medical Sciences, Banaras Hindu University, Varanasi.
orkshop on Techniques Employed in ight Microscopic Studies for Bio- ogy Teachers.	March, 1981	Department of Anatomy, Postgraduate Institute of Basic Medical Sciences, Madras.
ndo-US Workshop on Rheumatic Fever n the 1980's.	March 2-5, 1981	All India Heart Foundation, New Delhi.
irst National Workshop on Neonatal urgery.	March 2-7, 1981	Department of Paediatric Surgery, All India Institute of Medical Sciences, New Delhi.
eventh National Workshop on Basic echniques in Bacteriology and Serology for Surveillance of Rheumatic ever.	March 6, 1981	Department of Microbiology, Lady Hardinge Medical College and Hospital, New Delhi.
National Symposium on Corneal Disasters.	March 10-12, 1981	Dr.Rajendra Prasad Centre for Ophthalmic Sciences, New Delhi.
Symposium on Hypertension.	March 13-15, 1981	Digboi,Assam (Assam State Medical Conference).
First All India Symposium and Workshop on Anaerobic Infections in Man.	March 14-24, 1981	Department of Microbiology, All India Institute of Medical Sciences, New Delhi.
Workshop in Primary Health Care in Rural Areas with Special Reference to the Nurpur Bedi Pilot Project in Punjab.	March 16-18, 1981	Chandigarh (Institute of Economic Growth, Delhi).
Workshop on Standardised Analysis of Diagnostic and Socio-demographic Data at the National Level.	March 23-24, 1981	Department of Psychiatry, Postgraduate Institute of Medical Education and Research.Chandigarh (Indian Psychiatric Society).

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
Symposium on Trends in Lower Limbs Prosthetics.	March 28-29, 1981	Artificial Limbs Manufacturing Corporation of India, Kanpur (Orthotics and Prosthetics Society of India).
Workshop on Hospital Infections with Special Reference to Gram Negative Bacilli.	March 26- April 1, 1981	Department of Microbiology, All India Institute of Medical Sciences, New Delhi.
Symposium on Photophysical and Photochemical Process in Chemical and Biological Systems.	April 14-16, 1981	Mahabaleshwar (Indian Photobiology Society).
National Workshop on Appropriate Technology for Primary Health Care.	April 23-26, 1981	Indian Council of Medical Research, New Delhi.
Workshops on Recent Advances in the Field of Cytogenetics and Biochemical Genetic Disorders; Approaches and Methods of Early Intervention with Handicapped Infants and Children and their Families; and Prenatal Diagnosis - Place of Fetoscopy and Ammiocentesis.	May 1-2, 1981	Department of Pediatrics, Seth G.S. Medical College and KEM Hospital, Bombay.
Guha Research Conference 1981.	May 15-20, 1981	University of Kashmir, Srinagar, Kashmir.
Seminar on Deserts, Man and Health.	May 30, 1981	SMS Medical College, Jaipur.
Workshop-cum-Conference on Ocular Pathology.	July 11-12, 1981	Department of Pathology, Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry.
International Conference on Applications of the Mossabauer Effect.	July 13-17, 1981	Srinagar (Indian National Science Academy).
UNESCO-IBRO Workshop on New Techniques in Neurosciences	August 30 - September 12, 1981	National Institute of Mental Health and Neurosciences, Bangalore.
National Symposium on Corneal Disasters.	September, 1981	Dr.Rajendra Prasad Centre for Ophthalmic Sciences, New Delhi.
Symposium on Fertility Control and Teratology.	October 1981	JN Medical College, Aligarh Muslim University, Aligarh.

ymposium/Seminar/Workshop/ onference	Date	Institution/Department
th All India Congress of Cytology nd Genetics, 1981	October 17-21, 1981	University of Bhagalpur, Bhagalpur.
atellite Congress on Diabetes in the oung.	November 21-22, 1981	Ootacmund (The Coimbatore Branch of the Diabetes Association of India).
nternational Symposium on Incidence f Infections and Chronic Diseases - eographical Perspectives.	December 1-4, 1981	Department of Geography, University of Madras, Madras.
nternational Workshop on Nutrition nd the Development of the Child.	January 8-15, 1982	Department of Biochemistry, M.S. University, Baroda.

COUNCIL'S TRAINING PROGRAMMES FOR 1981

Leprosy:

At the Central Jalma Institute for Leprosy, Agra:

Training course in Leprosy for medical officers: (February 15 to March 28, 1981, and August 31 to October 14, 1981).

Virology:

At the National Institute of Virology, Pune:

(1) Diploma course in Medical Virology of Poona University: (July, 1981).

(2) *Workshop on Japanese Encephalitis in India.

Endocrinology:

At the National Institute of Nutrition, Hyderabad:

Annual certificate course in Endocrinological Techniques and their Application: (August to September, 1981).

Nutrition:

At the National Institute of Nutrition, Hyderabad:

(1) Annual certificate course in Human Nutrition for teachers from Agricultural Universities: (June/July, 1981).

(2) M.Sc. (Applied Nutrition) course: (June 1, 1981 to February 28, 1982).

(3) Annual certificate course in Public Health Nutrition: (October/November, 1981).

(4) Annual certificate course in Nutrition: (December 1, 1981 to February 28, 1982).

Haematology:

At the Blood Group Reference Centre, Bombay:

(1) A certificate course in Blood Banking Technology and Basic Haematology for medical officers: (February 1 to March 15, 1981).

(2) Training course in Blood Banking Methodology for technicians: (May 12-26, 1981).

Mental Health:

At Bangalore, Chandigarh and Delhi:

Training course on Extension of Mental Health Services in the Community: (July, 13 - August 22, 1981).

Occupational Health:

At the National Institute of Occupational Health, Ahmedabad:

NIOH/WHO Training Course on Air Pollution and Health: (June, 1981).

Clinical Pharmacology:

*At the Department of Pharmacology, Seth G.S. Medical College, Bombay.

Biostatistics:

At the Institute for Research in Medical Statistics, New Delhi:

(1) Certificate course in Planning and Evaluation of Health Programmes: (April,1981).

(2) Diploma course in Biostatistics: (September, 1981).

(3) Certificate course in Orientation to Biostatistics: (September, 1981).

(4) Certificate course in Statistical Techniques in Medical Research: (January, 1982).

Laboratory Animal Technology:

At the National Institute of Nutrition, Hyderabad:

(1) Laboratory Animal Supervisors Training Course: (January 2 to March 31, 1981).

(2) Laboratory Animal Technicians Training Course: (August 1 to September 30, 1981).

COURSES FOR TALENT SEARCH SCHEME FELLOWS

Cell-Biology and Cyto-Genetics:

At the Indian Institute of Scienc Bangalore: (March, 1981).

Use of Radioisotopes in Medicine:

At the National Institute of Nutritio Hyderabad: (July, 1981).

Immunological Techniques:

At the Central Jalma Institute for Le rosy, Agra: (November, 1981).

Haematological Techniques:

*At the Department of Pathology, Christi Medical College, Vellore.

Clinical Endocrinology:

*At the Institute for Research in Repr duction, Bombay.

* Dates to be announced later.

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NATIONAL WORKSHOP ON APPROPRIATE TECHNOLOGY FOR PRIMARY HEALTH CARE

Some more abstracts of papers read at the National Workshop on Appropriate Technology for Primary Health Care which was held at the Indian Council of Medical Research, New Delhi, between April 23-26, 1981, are presented here:

PREVENTIVE AND PROMOTIVE ACTIVITIES IN PRIMARY HEALTH CARE

In her paper on "Simple and Appropriate Approaches for Preventive and Promotive Services in Primary Health Care", Dr. Susheela Nayar (President, Kasturba Health Society, Wardha), said that preventive and promotive health care is a very wide subject. On the one hand, it must include health education, sanitation, safe drinking water better nutrition, better housing, while on the other, it must also incorporate specific measures for prevention of disease. This will include immunization, vector control, maternal and child health care, family planning and communicable disease control. Simple techniques to take these services to all the people within the next two decades have not only to be developed but also implemented. This will need the involvement of not only the health personnel of various categories but also active interest on the part of other developmental agencies.

In his paper on "Health Education for Primary Health Care", Dr. J.S. Gill (Centre for Community Medicine, All India Institute of Medical Sciences, New Delhi) said that the only way to achieve Health for All by 2000 is by making every individual a health worker-through health education. Health education reduces dependency and fosters self-reliance. It not only encourages better utilization of existing health services, but also creates demand for better services.

The strategy for health education encompasses several aspects and steps - (i) Firstly, there is need for large-scale integration of educational activities and inputs at all levels. For example, the following personnel must be involved in health educational activities at the block level - school teachers, non-formal and adult education staff, block extension educators, block extension officers (social education, agriculture *etc.*), village level workers, block PRO, PHC staff, animal husbandry staff *etc.*; (ii) the "transisistor revolution" has extended even to remote villages. This offers a big challenge - the challenge to produce sufficiently interesting health education broadcasts. Professional advertisers can be used, especially when attempting health education through print media/mass media; (iii) audio-visual aids are not widely available even to health workers. There is need for massive production and distribution of cheap aids such as posters, flash cards *etc.*; and (iv) there is need for a multi-pronged attack, using several media together. This should include at least one individual and one group approach. We should concentrate only on a few points but 'hit them hard', he said. The important role played by word-of-mouth publicity and opinion leaders should not be lost sight of.

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Many of the nutritional problems are preventable through the active cooperation and participation of the community, said Smt.Parvathi Rau (National Institute of Nutrition, Hyderabad) in her paper on "Preventive and Promotive Aspects of Nutrition". The experiences of the National Institute of Nutrition, Hyderabad, in the rural areas to overcome these problems with local village technology were ennumerated by her. The earliest experience was a supplementary feeding programme for pre-school children carried out by a group of Mahila and Youth Club members, who had been motivated through discussions with staff members. The children showed better growth performance and decrease in overt signs of protein-energy malnutrition (PEM).

A trained school teacher makes a noticeable impression on children at school, through practical demonstrations and by encouraging children to grow vegetables and fruits like papaya. As a result, the children in her study seemed more active and their knowledge regarding vitamin A deficiency and its treatment with green leafy vegetables and papaya had improved. A group of teenage girls who were trained could identify and successfully treat florid cases of PEM in their village with locally available foods and could also prevent the convention of unnecessarily 'branding' the children and administering herbal cures involving dietary restrictions.

In a nutrition clinic set up at the Primary Health Centre, supplementary nutrition and nutrition education were given. One third of the parents of children treated for PEM at the nutrition clinic were convinced and served as messengers for nutrition education in their villages and brought other PEM cases to the clinic. It was also found that there were no cases of PEM among the siblings.

Some Community Health Volunteers (CHVs) were trained specifically for tackling health and nutrition problems of children. The infant feeding practices and beliefs regarding PEM before and after the CHVs had been functioning showed a marginal change. On the other hand, the knowledge about the need for fluids and food during diarrhoea, the use of oral rehydration powder, the significance of weight in relation to disease in children as well as the preventive and promotive functions of the CHV, were well understood. All these experiences show that different groups of population can be used to deliver nutrition services, provided proper incentives, motivation and training are given.

In his paper on "Appropriate Technology for Prophylactic Immunization", Dr. R.N. Basu (Deputy Director General, Directorate General of Health Services, New Delhi) outlined the tasks to be performed in the delivery of immunization services. Each task must be included in the job description of the health workers of the vaccination team, he said. The materials furnished should be modified and adapted to suit local conditions and circumstances. An immunization schedule should be available to each health worker.

The appropriate place for vaccination sessions, the necessary equipment, information on vaccine handling, administration of vaccines and the necessary follow up were also discussed. New technology, with particular reference to the 'cold chain' equipment was highlighted. Several priority areas for research, such as increasing stability of vaccine, reducing the need for booster doses, introducing simple techniques of vaccine administration, improving the cold chain, and motivating the community were delineated.

HEALTH INFORMATION FOR PRIMARY HEALTH CARE

"Health Information for Decision Making in Primary Health Care" was presented by Dr. K. Ramachandran (Professor, Department of Biostatistics, All India Institute of Medical Sciences, New Delhi). He mentioned that recent decades have witnessed an increasing desire, all over the world, to achieve a socially optimal allocation of health resources and services within countries. The Alma Ata declaration is indeed a well-articulated culmination of this universal desire. To achieve this goal, planning and regulation of complex health care systems - *i.e.* delineation of health and health-related problems, statement of health objectives and their prioritization, formulation of alternative means of achieving the objectives and relative evaluation of these means, implementation of chosen means and finally evaluation of programme processes as well as impact - becomes a necessity.

Such a systematic approach to organisation and administration of health services has to be obviously based on sound knowledge and understanding of biologic and bionomic characteristics of health problems. Information, therefore, is the very foundation of a health care system. Information is not mere data. It has to be a representation of reality, reality in terms of the structure of the population group for whom the services are meant,

in terms of the resources of physical facilities, personnel, finance *etc.* and in terms of the quantum and type of activities that are undertaken. In otherwords, the information base in health care has to represent the planning and operational aspects as well as the biological and social aspects of the population group.

'Health Information System' is an attempt to integrate these bits of information into a highly structured complex so that it helps decision making and continually improves the quality of decision making. Health Care System has different levels and the Health Information System has to be tailored to help the decision making processes at all these different levels. The efficiency of a Health Information System would depend on timely acquisition of carefully limited amounts of useful information consistent with the level of the Health Care System. Herein lie the challenges in building up a meaningful Health Information System in India.

FAMILY PLANNING IN PRIMARY HEALTH CARE

In her paper on "Culturally Acceptable Contraceptives", Dr. Leela Phatak (Director, Birla Institute of Medical Research, Gwalior) described the experiences of the Birla Institute of Medical Research in its rural health activities during 1978-81 in the field of acceptability of contraceptives. The Institute took up rural health-cum-development projects in Primary Health Care from April, 1980. During the past 11 months detailed information had been gathered from 20 villages with a total population of 10,800.

A total of 144 persons from four villages had been supplied with condoms by the social workers from the Institute. There were another 136 males from four additional villages who were irregular users. It was during the socio-economic surveys that these men became acceptors. It was noted that in one village the initiative for the use of condoms came from the women who were illiterate and members of the *Mahila Mandal*. Several persons had opted for sterilization. The males preferred to have their operations done nearer their respective villages instead of going to mass camps. Data on individual reactions to the various contraceptives were also presented by Dr. Phatak.

"Cultural Acceptance of Family Planning" was presented by Dr. Ragini Prem (Banwasi Seva Ashram, Govind Pur, Mirzapur). It is recognised that urbanisation or a better standard of living is a good motivation for adopting family planning. Based on this observation a study was undertaken in the Sonpar tribal area of the Mirzapur district. The Agrindus Family Welfare Project, as this study was called, was initiated in 1968 and concluded in 1972. The study revealed that there is a positive correlation between the general awareness and progress in the village and the small family norm, favourable attitudes to family planning and practice of contraception.

A recent evaluation showed a gap between awareness and the practice of family planning, which calls for a further understanding of the problem. Undue haste in the propagation of family planning practices whilst curbing population growth, may undermine the significance of parenthood as such, and the happiness of the individual family and the community, and also encourage individualistic attitudes in society.

In his paper on "Profile of an Ideal Contraceptive", Dr. S. Chowdhury (Centre for Community Medicine, All India Institute of Medical Sciences, New Delhi) said that the success of the Family Planning Programme depends largely on acceptability. People will only accept devices that meet their mental image of suitability and not conflict with their cultural practices. An attempt was, therefore, made to ascertain the theoretical ideal of a contraceptive device from a selected sample of a rural population. Indepth interviews were conducted with residents of a small Harayana village situated about 40 km from Delhi. It was surprising to note the degree of unanimity in the answers elicited from the people of this community. In general, it seemed that the demand was for an injectable contraceptive device, applicable to the female with a duration of action of three years, with little or no effect on the menstrual cycle.

The search for acceptable fertility regulating methods involves research providing a profile of cultural specifications, to help guide biomedical scientists and those who support the development of contraceptive technology, according to Dr. Suman Mehta (Institute for Research in Reproduction, Bombay), in her paper on "Culturally Acceptable Contraceptives".

The results of a WHO study on user preference (with India as one of the centres)

suggest that "free choice" may be useful for assessing the potential demand for currently available or newly introduced contraceptives. The question arises as to when the attitude or belief is based on false information (*e.g.* IUD migrates to the stomach), whether it should remain unchallenged. The IUD programme suffered setbacks in India, because of unacceptability of the changes in bleeding pattern, yet this might have been avoided had the women been provided with adequate information about such changes. Unacceptability, thus may often be a modifiable and, therefore, a transitory state. In fact, it is probable that all methods currently in use are to some degree "unacceptable".

PHC-wise data from a district in Maharashtra reveal that over the years though the annual target for sterilization has always been exceeded, that for IUDs is always 30-70 per cent. Many reasons have been put forward for this. Alternative strategies like training of paraprofessionals and/or motivating the community were outlined by her.

"Appropriate Technology for Fertility Regulation", was presented by Dr. Badri N. Saxena (Director, Institute for Research in Reproduction, Bombay). The debate on appropriate technology for fertility regulation roughly follows three lines - do we need the hardware approach or the software approach, or a mix of both these approaches? The shortcomings of both hardware and software approaches and their mutual interdependence is now being increasingly recognised. In the hardware approach, the basic assumption is that the answer to the problems in family planning lies in better birth control technology. However, there is sufficient evidence to suggest that "an ideal contraceptive" is utopian and a variety of family planning methods is essential in view of the divergent needs and requirements of the users.

There is enough evidence to indicate that where motivation is high and the infrastructure for health care delivery is satisfactory, currently available contraceptive methods, *e.g.* conventional contraceptives, IUDs, pills and sterilization, have proved to be adequate. Therefore, the software approach protagonists argue that the technology, however, appropriate will remain under-utilized, if the delivery network and socio-cultural aspects of family planning methods are neglected.

In his paper on "Technology of Fertility Regulation", Dr. Somnath Roy (Director, National Institute of Health and Family Welfare, New Delhi) mentioned that fertility regulation has two main aspects *viz.* (i) fertility limitation in normal couples and (ii) fertility promotion in infertile couples. To achieve the objective of a net reproduction rate of one, 60 per cent of the couples have to be protected. At present, only 23 to 24 per cent of couples in the reproductive age group are being protected. The Family Welfare Programme can make substantial gain in contraceptive use through - (i) introducing existing methods which are new to the programme; (ii) offering presently available methods through new delivery systems; and (iii) introduction of new models of previously promoted methods. The currently available approaches and promising areas of new development, for females as well as males, were discussed by Dr. Somnath Roy.

The use of contraceptive methods are largely guided by two desirable characteristics - (i) acceptability of the method to individual users and to the community; and (ii) practicability for employment in the programme. It is no longer aimed to develop an ideal method. Contraceptive needs of individuals and different population groups are varied. Low cost, simplicity and ease of delivery by indigenous programme workers are some of the important virtues of the contraceptive.

The need for new contraceptives cannot be separated from the consideration of their acceptability which is dependent on socio-cultural factors influencing behaviour related to fertility and contraceptive use. While the emphasis in the Family Welfare Programme is on limitation of family size, the fruits of scientific knowledge and technological advances should be available for the treatment of infertile couples.

Dr. B.C.Ghoshal (Director, Central Health Education Bureau, New Delhi) in his paper on "Health Education in the Field of Family Planning", said that in view of the alarming rise in the growth rate of our population, it is necessary to intensify our efforts in health education so as to bring about changes in the knowledge, beliefs and reproductive behaviour of the people with regard to (i) acceptance of the small family norm; (ii) group support for change; and (iii) practice of family planning methods.

The results of research on health education activities in the Rural Field Study Demonstration Centre of the Central Health Education Bureau at Pataudi were reflected in the increasing sterilization figures - the sure criterion for family limitation. Several lines of action were suggested by him for health education like organising workshops at state and district levels; integration of training for the family welfare programme in the existing curriculum of teachers training; training in nutrition *etc.* Follow up workshops may be organised by the State Health Education Bureau to coordinate activities along with AIR, TV, DAVP *etc.* Special courses should be organised periodically for MPWs and CHVs at block level. Population education should be introduced in formal and non-formal education programmes. Strengthening of the health education component in the syllabi for the undergraduate medical courses in all systems of medicine, is another important step.

ENVIRONMENTAL SANITATION

In India, from 1951 onwards, there has been considerable investment on potable water supply for rural communities said Dr. A. Raman (NEERI Zonal Laboratory, Delhi) in his paper on "Potable Water Supply and Management". The investment may increase several fold from now on because of the International Water Supply and Sanitation Decade. The objective of the rural water supply programme in the country has been basically to meet the acute water scarcity.

The potential health benefit from potable water supply is by prevention of water-related diseases - water-borne, water-washed and water-based. This benefit is not often demonstrable due to inherent difficulties in evaluation. The benefit may also be often not realised due to such factors as neglect of the allied sector of basic sanitation, wrong planning and management of the facilities and unfavourable usage habits of the community. In order to improve the impact on health, these factors have to be corrected. Health education and increased community participation have to be promoted. Health hazards that might arise from improved water supplies such as breeding of disease vectors have to be guarded against.

In his paper on "Community Participation in Environmental Sanitation", Dr. Ram Das (All India Consortium on Appropriate Technology, Gandhi Peace Foundation, New Delhi) said that appropriate technological models have been developed for supporting the environmental sanitation programme by a number of governmental and voluntary research agencies, but the main problem is to find ways and means of transferring the successful results of such researches to the people, so that they could be motivated to accept them.

Experiences are available on successful pilot projects started by some agencies with the active involvement of the local communities, both for the sanitary disposal of human excreta and for safe drinking water supply. Experiences are also available to show that the local panchayats have been quite successful in running and maintaining piped water supply for periods extending upto ten years and more.

Suitable infrastructures have, therefore, to be built which may create the necessary awareness and develop an urge in the local communities so that they may accept such models and utilize them. There is also need to have an organisation at the apex level responsible for formulating and laying down policies and procedures, for raising resources for materials, personnel and finances, and to provide direction and supervision of the environmental programmes.

RURAL DEVELOPMENT AND PRIMARY HEALTH CARE

According to Dr.Devendra Kumar (Director, Centre of Science for Villages, Wardha) who presented a paper on "Technological Needs for India's Rural Development", villages may be classified as small (S), medium (M),or big (B) depending on the population of the village. This S-M-B nature of villages must be considered while taking new technologies to the villages. There are certain inputs which are common to all villages, while others would be applicable only to the medium level villages and still others may be optimal for the B level only. Thus the Big, Medium and Small strategy is necessary if new technologies are to have any bearing on the rural economy both in terms of benefits and utility.

Rural development requires technologies which will ensure more days of work for the villagers. These inputs should be such that they do not widen the gulf between the rich and poor, but help to bridge them.

To satisfy the energy and fuel needs of the village, renewable resources like biogas,

solar, wind and micro-hydel energy should be harnessed. Improvement of rural housing using indigenous methods and materials for making the mud walls non-erodable, insulation of the roof *etc.* was discussed. Sanitary disposal of sewage and sullage could be done using soak pits. Safe drinking water could be provided at certain meeting points in the village rather than at every house. Experiments in collection and storage of rain water for drinking, in mud pots stacked by the side of outer walls, have been successful.

The scope for generation of employment particularly at the peripheral or community level was identified by Dr. M.C. Swaminathan (National Institute of Nutrition, Hyderabad) in his paper on "Employment Generation for Primary Health Care". The major activities of the Primary Health Centre which lend themselves for generation of employment will be medical care for minor ailments, preventive care, improvement of environmental sanitation and water supply, maternal and child health, family planning, nutrition and health education. The main principle behind the employment is not to replace the existing personnel but to strengthen them so as to widen the coverage of services and develop strong local links between the health services and the community. This principle is applied to the Community Health Volunteers Scheme. The methods involved could be encouragement of private enterprise for marketing essential hardware for health, or payment for certain activities performed in relation to health care. Local manpower could be utilised for the various components of primary health care. It is also important to consider the mode of payment, which should be flexible to suit the conditions, such as payment in kind and sharing of agricultural or other local produce.

The scope for research studies in order to test some of these concepts of generation of employment for primary health care was also discussed.

In her paper on "Social and Health Problems of Women in Rural India", Dr. P. Ramalingaswami (Chairman, Centre for Social Sciences, Jawaharlal Nehru University, New Delhi) described the social handicaps of women, such as lack of education, early marriages *etc.* The woman's role in the family and her status in the community were discussed. The problems of poverty and inadequate income of rural women were defined and the influence of these factors on the health of women, and the health care delivery systems were highlighted. A strategy for improving the health of the rural women was suggested.

"Education for Primary Health Care within the Educational Framework - A Case for an Alternative Delivery System" was presented by Dr. A.K. Jalaluddin (National Council of Educational Research and Training, New Delhi). Any educational input for Primary Health Care, in order to be meaningful and effective, should take into account the limitations of the existing delivery system responsible for providing the health and educational services. As the community does not happen to be a homogeneous entity, the existing delivery systems of health, education and other social programmes have traditionally been tilted to suit the aspirations and needs of the more articulate interest groups representing the drug industry, medical profession, administration and the traditional beneficiaries. Any further expansion of the existing delivery system without introducing appropriate changes in it is, therefore, not likely to deliver the goods in the form of "Health for All by the Year 2000". It may be pragmatic to visualise the role of the governmental infrastructure in education, health and family welfare as a supportive, regulatory and evaluative mechanism, rather than as a provider of the health and educational facilities and services at the grass roots. The actual delivery of the services may be ensured through a network of community based auxiliary social entrepreneurship projects created for the above purpose. Such projects may be manned and managed by the local enterprising youth trained by the existing technical support service under a contractual arrangement. Such social projects may as well be encouraged to hire the services of the locally available professional manpower on a competitive basis.

It is quite possible that such a community based auxiliary delivery system would ultimately prove to be more responsive to the local conditions and needs and also be cost-effective. Apart from the cost considerations, such an auxiliary network may also prove to be handy for the implementation of other social programmes like family planning, environmental conservation and introduction of rural technology based on recycling of waste, solar energy, *etc.*

What is proposed here is an appropriate management approach for the solution of the traditional problems of implementation of

primary health care and supportive educational programmes taking advantage of the inter-play of the market forces and social control. There does not seem to be any soft, conventional solution of the problem of delivery of the primary health care and educational services to the growing millions of the under-served in the country.

In "Appropriate Technology for Primary Health Care, Non-Formal Health Education at the Family and Community Level", Dr. Shakuntala Bhatnagar (Centre for Community Medicine, All India Institute of Medical Sciences, New Delhi) said that non-formal education is a life-long learning process integrated with the daily activities of life. It has a diversified, flexible curriculum responsive to the learner and environmental needs and relies on full participation from the learner - unlike formal education which has fixed points of entry and exit and which is geared towards impersonal goals of knowledge acquisition.

In India, non-formal education (including subjects on health, at least theoretically) is being given under programmes of adult literacy and functional literacy for women. It was later adopted on a national basis from 1978, for the age group 15 years and above. Institutions like Literacy House and NCERT prepared the resources and audio-visual materials. Non-formal education for the pre-school children was implemented in an organised manner in the ICDS projects. This is partly to rectify and regenerate interest in formal education subsequently.

A well meaning programme with a well drawn out 'syllabus' for the functional literacy of women has been constructed, but its implementation in both rural and urban areas has been very defective. An evaluation of the functional literacy programme was undertaken by the Social Welfare Department. Dr. Bhatnagar recommended that functional education should be undertaken by all the village level workers and health and non-health functionaries at various interfaces of the daily life. The role of mass media in non-formal education cannot be minimised. The role of voluntary organisations of women and others is very important. A major contribution can be made by preparing innovative, attractive, thought provoking yet simple teaching material for all the age groups.

ABSTRACTS

Some Research Projects completed recently

Metabolic significance of ascorbic acid in human sperm motility and metabolism

Studies were carried out to evaluate the significance of ascorbic acid in human sperm motility and metabolism. Studies of biochemical constituents and ascorbate metabolism in semen of normo-, oligo- and azoospermic men revealed that ascorbic acid played an important role in sperm motility and metabolism. The ascorbic acid in the human semen was contributed by the accessory sex glands, mainly the seminal vesicles. The semen of impaired quality had higher free and total ascorbate concentrations due to its non-utilization as a consequence of the absence of spermatozoa. The normospermic individuals had comparatively higher turnover of ascorbate than oligospermics or azoospermics.

Vasectomy had no effect on utilization of manganese by epididymis in rodents. Studies carried out with rodents established close interrelationship between the metabolism of sex steroids and ascorbic acid. Ascorbic acid was found to potentiate the anabolic effects of testosterone in rat epididymis. It was found that ascorbic acid participated in steroid metabolism via free radical mechanism and charge transfer complex formation. Studies with vasectomized rodents revealed that androgen dependent parameters were altered by vasectomy, but exogenous administration of ascorbic acid restored these parameters to almost normal values.

Investigations were carried out in normo-, oligo-, azoospermic and vasectomized men with respect to the metal ions and the electrolyte content in seminal plasma and sperm pellet respectively. The study revealed that the overall metal ion and electrolyte distribution in seminal fluid was not significantly different amongst the semen categories and vesectomy did not produce any adverse changes in seminal fluid constitution.

The effects of estradiol benzoate administration on ascorbate metabolism, steroidogenesis, protein and cholesterol concentra-

tions of testis and adrenal, and serum testosterone, FSH and LH profile of immature and mature rats were investigated. The data revealed that the treatment resulted in decreased androgen production and ascorbate metabolism, while gonadotropin levels remained unchanged. *In vitro* studies revealed that testicular steroidogenesis was more markedly enhanced with media containing pregnenolone and ascorbate than those containing pregnenolone alone.

Studies were performed on rodents to elucidate the antifertility effects of cyproterone acetate (CA) and the beneficial effects of ascorbic acid. It was seen that CA manifested antianabolic, antifertility and anticontractile effects in rodents and ascorbic acid had a beneficial role in maintaining the metabolism in reproductive organs of CA treated animals without interfering with its antifertility effect.

N.J. Chinoy
Department of Zoology
University School of Sciences
Gujarat University
Ahmedabad.

Publications:

1. Chinoy, N.J. and Buch, R.P. Metabolic significance of ascorbic acid in human semen. *Indian J Exp Biol 15:* 921, 1977.

2. Chinoy, N.J., Seethalakshmi, L. and Singh, Y.D. Beneficial role of ascorbic acid in vasectomy. *Indian J Exp Biol 16:* 162, 1978.

3. Chinoy, N.J. and Seethalakshmi, L. Preliminary studies on manganese free radical in vasectomy. *Indian J Exp Biol 16:* 1318, 1978.

4. Chinoy, N.J. and Seethalakshmi, L. Hormonal control of tissue distribution and metabolism of ascorbic acid in male rats. *J Anim Morphol Physiol 25:* 235, 1978.

5. Chinoy, N.J. and Rao, M.V. Inter-relationships between ascorbic acid and sex hormones in steroidogenic tissues and ascorbic acid synthesizing tissues of albino rats. *J Anim Morphol Physiol 26:* 1, 1979.

6. Chinoy, N.J., Rao, M.V. and Seethalakshmi, L. Effects of gonadectomy and sex hormone replacement on tissue distribution of ascorbate in male and female albino rats. *Indian J Exp Biol 17:* 1171, 1979.

7. Chinoy, N.J., Seethalakshmi, L., Buch, R.P. and Sanjeevan, A.G. Studies on Sperm maturation. In: Recent Advances in Reproduction and Regulation of Fertility. Ed. G.P. Talwar. Elsevier North-Holland, Amsterdam. p. 259, 1979.

Development of biodegradable polymers for medical applications

Polymers based on lactic acid and glycolic acid were prepared. *In vitro* studies on testosterone incorporated polylactic acid matrix in rod form were then undertaken. It was established from these studies that the polymers prepared were biodegradable and the incorporated drug could be released in biological liquid medium. Experiments to polymerize L(+) lactic acid to get high molecular weight polylactic acid [L(+) PLA] were done. In addition, optimum loading of NET acetate on L(+) PLA was established and 30 per cent loading was found to be suitable to get required implants by moulding and subsequent use of these implants for drug release in biological liquid medium and in animal trials.

Studies were also carried out on biodegradability and leaching rate of polymer samples containing 30 per cent norethisterone acetate, for a period of about one month. The drug release studies indicated that the polylactic acid prepared could be used as polymer matrix for release of incorporated drug and would degrade itself in the biological liquid medium. The conditions to optimize dosages of gamma irradiation to be used for sterilization of implants were standardized and 2.5 m rads dose of gamma irradiation was found to be optimum to sterilize the implants. Experiments carried out to study the storage life of implants with and without gamma irradiation under anhydrous conditions for about 5 months indicated that the implants maintained their shapes, size and colour.

M.M. Bhan
Sri Ram Institute of
Industrial Research
Delhi.

ICMR NEWS

dvisory Committee/Expert Group Meetings:

The Scientific Advisory Committees of the ollowing Institutes/Centres of the Council et during the month:-

lational Institute of lutrition, Hyderabad	July 2-3, 1981
ood and Drug Toxicology entre, and Laboratory nimal Information Ser- ice, Hyderabad	July 3, 1981
uberculosis Research entre, Madras	July 4, 1981
ector Control Research entre, Pondicherry	July 6, 1981
lood Group Reference entre and Enterovirus esearch Centre, Bombay	July 13, 1981
National Institute of Virology, Pune	July 14-15, 1981

The following ICMR Expert Groups/Working Groups met during the month:-

Working Group on Abortion	July 6-7, 1981
Expert Group on Health Services Research	July 17-18, 1981

ICMR Talent Search Scholars 1981:

The following candidates have been selected for the TSS Fellowships for 1981:

1. Dr. Christie P. Thomas, Christian Medical College, Vellore.
2. Dr. B. Ramesh Babu, Guntur Medical College, Guntur.
3. Dr. Ajit S. Gandhi, Dr. V.M. Medical College, Sholapur.

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Dr. V. Ramalingaswami, Director-General, ICMR. New Delhi, delivered the Dr. Sivanandam Endowment Lecture at Coimbatore on July 5, 1981.

Dr. Badri Saxena, Senior Deputy Director General, ICMR, New Delhi, attended the Steering Committee meeting of the WHO Task Force on 'Long-acting Agents for the Regulation of Fertility', at Geneva between July 13-17,1981.

Dr. Usha Malhotra, Assistant Director, National Programme for Research in Human Reproduction, and Shri S.T. Athalye, Financial Adviser, ICMR, New Delhi, participated in a workshop on 'Development in Finance and Administration (DEVFIAD)', organised by the International Development Research Centre at Singapore between July 13-15, 1981.

Dr. K.Prema, Assistant Director, National Institute of Nutrition, Hyderabad, participated in the Steering Committee meeting of the WHO Task Force on 'Oral Contraceptives', held at Geneva between July 14-17, 1981.

Dr. V. Ramalingaswami, participated in a meeting of the SEA/ACMR Sub-Committee on 'Research Needs for Health for All by the Year 2000 AD', held at SEARO, New Delhi, between July 21-23, 1981. He also participated in a meeting of the SEA/ACMR Sub-Committee on 'Health Services Research' between July 24-27, 1981.

Dr. U.M. Joshi,Assistant Director, Institute for Research in Reproduction, Bombay, participated in the Steering Committee meeting of the WHO Task Force on 'Standardization and Quality Control of Radioimmunoassay of Hormones in Reproductive Physiology', held at London from July 27-29, 1981.

ICMR AIDED SYMPOSIA/SEMINARS/WORKSHOPS/CONFERENCES

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
Workshop-cum-Conference on Ocular Pathology.	July 11-12, 1981	Department of Pathology, Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry.

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
Transcultural Psychiatric Meet.	August 23-25, 1981	Madurai Medical College, Madurai.
UNESCO-IBRO Workshop on New Techniques in Neurosciences with special reference to the Neurophysiology of Higher Nervous Activity.	August 30 - September 12, 1981	National Institute of Mental Health and Neurosciences, Bangalore.
Virology Conference.	September 28-30, 1981	Central Potato Research Institute, Simla.
National Symposium on Corneal Disasters.	September, 1981	Dr.Rajendra Prasad Centre for Ophthalmic Sciences, New Delhi.
4th All India Congress of Cytology and Genetics, 1981	October 17-21, 1981	University of Bhagalpur, Bhagalpur.
First National Conference on Environmental Biopollution.	October 19-21, 1981	Marathwada University, Aurangabad (Indian Aerobiological Society).
Symposium on Fertility Control and Teratology.	October, 1981	JN Medical College, Aligarh Muslim University, Aligarh.
Seminar-cum-Workshop in Surgery for Postgraduates and Surgeons.	October 31 - November 1, 1981	All India Institute of Medical Sciences, New Delhi.
Conference on Industrial and Environmental Toxicology.	November 6-7, 1981	Industrial Toxicology Research Centre, Lucknow (Society of Toxicology, India).
Satellite Congress on Diabetes in the Young.	November 21-22, 1981	Ootacmund (The Coimbatore Branch of the Diabetes Association of India).
Symposium on Tropical Immunology.	November 23, 1981	Cancer Research Institute, Tata Memorial Centre, Bombay (Indian Immunology Society).
Seminar on Teaching and Research in Medical Sociology in India.	November, 1981	University of Jodhpur, Jodhpur.
International Symposium on Incidence of Infections and Chronic Diseases Geographical Perspectives.	December 1-4, 1981	Department of Geography, University of Madras, Madras.
International Workshop on Nutrition and the Development of the Child.	January 8-15, 1982	Department of Biochemistry, M.S. University,

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*At the Department of Pathology, Christian Medical College, Vellore.

Clinical Endocrinology:

*At the Institute for Research in Reproduction, Bombay.

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* Dates to be announced later.

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5 OCT 1981

C.F.T.R.I. MYSORE

OCCUPATIONAL HEALTH PROBLEMS AMONG TOBACCO WORKERS

Sickness associated with tobacco harvesting has been reported by Gehlbach and colleagues[1,2] and Sakaadze[3]. This occupational sickness includes symptoms like nausea, vomiting, dizziness, prostration, weakness, *etc.* and appears frequently but for a short duration among tobacco harvesters. These symptoms are collectively termed as green 'symptoms'. The etiology is not clearly known but according to Gehlbach *et al*[1,2], nicotine absorbed through the skin, while the workers are engaged in handling the 'uncured' tobacco leaves, is the causative agent for such sickness. It is also reported that there is a rise in the urinary levels of nicotine and its metabolite *viz.* cotinine, among tobacco workers when handling green tobacco leaves. Although India is a major tobacco producing country, employing no less than 1,21,000 workers per day in the organised sector[4] there are no reports[5-11] of the occurrence of the 'green symptoms' before 1976. It was, therefore, felt necessary to carry out a study in India, to assess the incidence and etiology of 'green symptoms' among tobacco cultivators of both Virginia (*i.e.* cigarette tobacco) and non-virginia tobacco. The work has also been extended to beedi tobacco processing workers.

In India, tobacco is mainly cultivated in two states, *viz.* Gujarat and Andhra Pradesh. Studies were undertaken in Sanand town in Ahmedabad district of Gujarat State where non-virginia tobacco is grown as well as in the Central Tobacco Research Institute (CTRI) farm at Rajahmundry, Andhra Pradesh, well known for cultivation of Virginia tobacco. Suitable control subjects were also included from each place. The total population of Sanand is nearly 19,000 of which about 3,000 were tobacco cultivators at the time of the study. A total of 290 (202 male and 88 female) tobacco cultivators and 150 control (111 males and 39 females) subjects (rice cultivators) were selected by the random sampling technique. Similarly, 289 (90 male and 199 female) tobacco cultivators were selected from the CTRI farm and 151 (85 male and 66 female) non-tobacco workers included as control subjects from the same region.

Studies on the occupational health problems among beedi tobacco processing workers were also undertaken in two factories situated in the town of Nadiad. The study was carried out on 100 beedi workers (74 female and 26 male) and 50 control subjects (42 female and 8 male). The investigations included detailed medical surveillance, pulmonary function tests, estimation of nicotine and cotinine from urine samples and also aerobiological studies.

Pulmonary function tests (PFT) *i.e.* vital capacity (VC) and forced vital capacity (FVC) were recorded by using Vitalograph spirometer. The forced expiratory volume in one second percentage ($FEV_{1\%}$) and forced expiratory flow between 25 to 75 per cent ($FEF_{25-75\%}$) were calculated from FVC curve. Wright's peak flow meter was used for recording peak expiratory flow rate (PEFR).

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Rate of urinary excretion of nicotine and cotinine was measured using the method of Hucker and associates[12] with the modification outlined by Ghosh and co-workers[13]. Aerobiological studies included aeropalynological and aeromycological surveys. These surveys were conducted by qualitative method (gravity slide method) as well as by quantitative method (by using midget impinger). The techniques were essentially the same as recommended by the American Academy of Allergy[14] and others[15,16].

Investigation of Tobacco Cultivators:

Out of the 290 subjects working with non-virginia tobacco, 250 subjects (86.20 per cent) had one or the other component of the 'green symptoms'. These symptoms could be conveniently grouped under neurological complaints and respiratory complaints. Neurological complaints include headache, giddiness, nausea, vomiting *etc.* while complaints like dry cough without expectoration, breathlessness *etc.* are regarded as respiratory complaints. Gastrointestinal disturbances like indigestion, diarrhoea, constipation *etc.* were also reported by subjects having 'green symptoms' (14.14 per cent). Thus, the majority of the subjects complained of headache (55.86 per cent), followed by giddiness (47.24 per cent) and 13.10 per cent of cases reported nausea, the complaints occurring simultaneously in some subjects. Among those having 'green symptoms', 28.62 per cent were suffering from breathlessness.

Among 289 subjects engaged in Virginia tobacco operation, a total of 175 subjects (53.29 per cent) reported complaints of 'green symptoms'. About 44 per cent of the subjects complained of weakness and many of the subjects (46.94 per cent) complained about the appearance of the symptoms during working hours only. It was also observed that these symptoms may occur, in case of non-virginia workers simultaneously or separately. The occurrence of 'green symptoms' was found to be related to the nature of the work performed by the subject. Nausea and vomiting were the common symptoms among the subjects carrying leaves for curing process, while weakness, headache, and giddiness were found more among the subjects engaged in uprooting of the plants or plucking of the green tobacco leaves. The symptoms lasted for only a few hours in most of the cases and were relieved without any medication. Consumption of tea and jaggery followed by rest was reported to relieve the symptoms.

Urinary Excretion of Nicotine and Cotinine: Male smokers before handling the non-virginia tobacco excreted 1.43 ± 0.16 µg/ml nicotine, whereas during exposure to the tobacco, they excreted 4.87 ± 0.5 µg/ml. The rate of urinary excretion of nicotine among the control subjects (smokers) was found to be 1.66 ± 0.37 µg/ml. During exposure to tobacco, all the subjects were found to have 'green symptoms' and the level of nicotine excretion was significantly ($P < 0.01$) higher than that of the controls, thus indicating a relationship between nicotine excretion and appearance of 'green symptoms'.

Nicotine and cotinine excretion among male non-smoker subjects during exposure to tobacco were 1.33 ± 0.40 µg/ml and 3.25 ± 0.56 µg/ml respectively, while female subjects excreted 3.25 ± 0.19 µg/ml and 2.48 ± 0.40 µg/ml respectively. In the control non-smoker subjects, the excretion of nicotine and cotinine were below detectable levels in both sexes. In the exposed group of workers handling non-virginia tobacco, the rate of excretion of nicotine and its major metabolite-cotinine were always higher in comparison to the control subjects irrespective of sex, smoking habits *etc.* This again shows the relationship of handling green tobacco leaves and the occurrence of 'green symptoms'.

The exposed subjects handling Virginia tobacco were divided into subjects showing 'green symptoms' and those not having the symptoms. The excretion rates of nicotine and cotinine were significantly high only in those exposed subjects showing 'green symptoms', indicating a relationship between the urinary excretion of nicotine and cotinine and the occurrence of 'green symptoms'. It was also observed that the percentage of 'green symptoms' among the subjects handling Virginia tobacco was less (53.29 per cent) in comparsion to the workers handling non-virginia tobacco (86.20 per cent). This may be due to the higher concentration of nicotine in non-virginia tobacco (Personal Communication from Central Tobacco Research Institute, Rajahmundry). Female exposed workers were found to have a higher incidence of 'green symptoms' than the males. Among smokers, those who used country cigars were found to be more affected with 'green symptoms'.

Pulmonary Function Tests: Comparison of pulmonary function tests in smokers between control and exposed groups handling non-virginia tobacco leaves, showed significant reduction in VC and $FEV_{1\%}$ in the exposed

workers, in both the sexes. This suggests the presence of both obstructive and restrictive functional disorders leading to deterioration of functional activity of the lungs in the exposed subjects. Only $FEV_{1\%}$ was reduced significantly in non-smokers in the exposed group, indicating that the smoking habit might be the additive cause that resulted in the loss of VC among smokers in the exposed group.

In case of Virginia tobacco workers highly significant reduction in VC and flow rates, $FEF_{200-1200\ ml}$ and $FEF_{25-75\%}$ and a significant decrease in $FEV_{1\%}$ were observed only among the subjects showing 'green symptoms', while the subjects without 'green symptoms' showed only reduction in VC. This indicates that both obstructive and restrictive type of functional disorders of the lung occur in the exposed subjects who experience the 'green symptoms'. Significant reduction in $FEV_{1\%}$ and $FEF_{25-75\%}$ were seen only in exposed male workers showing 'green symptoms'. But, in female workers all functional parameters showed only a downward trend. When compared according to smoking habits, even non-smoking exposed subjects among males showed significant reduction in VC, $FEV_{1\%}$ and $FEF_{25-75\%}$ indicating deterioration of the functional activity of the lung. In female exposed smokers only a significant reduction in $FEF_{25-75\%}$ was observed, indicating peripheral airway obstruction.

Aerobiological Studies: Since it has been reported[3] that the 'green symptoms' may be due to aeroallergens like pollen grains and fungal spores, aerobiological survey of the tobacco fields was carried out to determine the occurrence of specific spores and pollen grains.

In case of non-virginia tobacco fields, large number of isolates were found to be belonging to genera *Cladosporium* and *Alternaria*. During the non-cropping season, the number decreased considerably. The occurrence of these fungi is significant, as they are well-known to cause naso-bronchial allergy. In Virginia fields, these spores were found to be very minimal. The prevalence of 'green symptoms' was also found higher among non-virginia field workers (86.20 per cent) in comparison to the Virginia field workers (53.29 per cent). However, field samples of Virginia tobacco always showed higher number of pollen grains. Usually, the central part of the field showed the presence of more number of pollen grains as well as fungal spores.

Investigation on Beedi Tobacco Processing Workers:

The occupational history showed that 69 exposed subjects had symptoms like vomiting, giddiness, headache, tiredness, loss of appetite *etc*. These symptoms occurred only after heavy dust exposure or during hot summer days. They occurred occassionally and persisted for a few hours only. In most cases, they subsided without the use of any medication and the labourers were able to work the next day. The symptoms were thus mild and did not incapacitate the workers. These symptoms were not specific to any particular age group, sex, duration of exposure or smoking habits.

The rates of nicotine and cotinine excretion were estimated among the exposed group which was further divided according to sex and smoking habits of the subjects. The excretion rates of nicotine and cotinine were found higher among the exposed subjects in comparison to the control group, suggesting a relationship between the urinary excretion of nicotine and its major metabolite-cotinine and the occurrence of these symptoms. The concentration of nicotine in the working environment was also higher (1.18 mg/m^3) than TLV suggested by ACGIH, USA (0.5 mg/m^3). Dust samples were also processed for the isolation of various types of fungi and it was found that species of *Aspergillus* and *Cladosporium* were the main isolates.

The comparison of PFT in control and exposed workers showed a significant reduction in $FEF_{25-75\%}$ among the female workers. VC, $FEV_{1\%}$ and PEFR are also lower among the female exposed workers. Slightly higher flow rates were recorded in male exposed workers which may be due to the work pattern of manual load carrying operations. The significant decrease in $FEF_{25-75\%}$ in female workers indicates peripheral airways obstruction, which can be attributed to the effect of the tobacco dust.

The symptoms of the tobacco processing workers resemble those of the workers engaged in the agricultural operation of tobacco cultivation. However, the mode of exposure is different in tobacco processing work, the route of entry being inhalation, while in case of agricultural operations it is absorbed through the skin.

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Contributed by Dr. S.K. Ghosh and colleagues, based on the studies carried out at the National Institute of Occupational Health, Ahmedabad.

ABSTRACTS

Study of host factors in the severity and chronicity on amoebiasis

A total of 172 patients of amoebiasis were studied to evaluate the alterations in some host factors with the severity and chronicity of amoebic infection. For comparison, volunteers, healthy relatives of the patients and medical students were included. The patients studied included 117 cases of intestinal, 50 cases of hepatic and 5 cases of both intestinal and hepatic amoebiasis. In addition to routine investigations, acid secretion and detailed immunological assessment were done. The results revealed that amoebiasis predominantly affected males in the age groups of 21-40 years. An association of amoebic infection with chronic alcoholism was found. Significant anaemia (Hb < 8g%) was observed in 20 cases. Hypoalbuminaemia of less than 2.7 g% and hypergammaglobulinaemia of more than 3.1 g% were recorded in about one third cases where the tests could be done. The elevation of SGOT/SGPT and alkaline phos-

phatase was insignificant. Serological tests like indirect haemagglutination and bentonite flocculation test were positive in about three fourth of the cases of invasive amoebiasis and were of great diagnostic value in cases of extra-intestinal amoebiasis with atypical presentation. Acid secretion in amoebiasis was almost same as in the control subjects.

Results of cell mediated immunity tests revealed impaired cellular response as assessed by Mantoux test, DNCB and leucocyte migration inhibition test in patients with ameobic infection. There was a fair degree of correlation between the results of leucocyte migration inhibition and dinitro chlorobenzene test.

D.S. Singh
Department of Medicine
Jawaharlal Institute of
Postgraduate Medical Education
and Research
Pondicherry.

Experimental production of Charcot-like arthropathy

Studies were undertaken on experimental production of Charcot-like arthropathy by repeated intra-articular hydrocortisone acetate injections in guineapigs and goats.

Clinical, macroscopic and histopathological studies were carried out on the knee joints of both the animals. The guineapigs as well as goats started limping on the hydrocortisone injected knee after few weeks of injection. Macrosocpic assessment of the specimens revealed loss of lustre, roughness and thinning of the articular cartilage with chalky deposits on the articular cartilage as well as on the adjoining soft tissues both in guineapigs and goats. However, the changes in goats were more marked and severe. Destructive histopathological changes were produced on the articular surfaces. At places the whole thickness of articular cartilage was eroded leading to exposure of the subchondral bone. The changes were comparatively more obvious at the pressure points. These atrophic changes following hydrocortisone injection as seen after 4 months in goats, led to definite hypertrophic neuropathic changes in the knee joints after fifth and sixth months of hydrocortisone acetate injections. In the control joints no changes were observed in either of the animals.

Repeated intra-articular hydrocortisone acetate injections were, therefore, found to produce a Charcot-like joint and induction of Charcot-like joints by this method has been suggested to provide a good experimental model for studying the different details of management of neuropathic joints.

S.S. Jha
S. Pandey
Department of Orthopaedics
Rajendra Medical College
Ranchi.

ICMR NEWS

The ICMR Expert Group on Health Services Research met at the Council on August 28-29, 1981.

Seminars/Symposia/Conferences:

In order to identify the priority areas for research in the psychosocial aspects of family welfare, the ICMR is organising four regional seminars involving technical experts, administrators, political leaders and field workers from different regions of the country. The Western Regional seminar was held in Bombay on August 3-4, 1981.

Dr. S.P. Tripathy, Director, Tuberculosis Research Centre, Madras, participated in the 12th International Congress of Chemotherapy held at Florence, Italy, between July 19-24, 1981.

Dr. S.K. Dave, Senior Research Officer, National Institute of Occupational Health, Ahmedabad, participated in an international symposium on Education and Training Policies in Occupational Safety and Health held at Oslo, Norway, from August 16-19, 1981.

Dr. S. Sriramachari, Acting Director-General, ICMR, New Delhi, delivered the keynote address at the inauguration of the WHO Intercountry Course for Clinical Management of Acute Diarrhoeal Diseases at the National Institute of Cholera and Enteric Diseases, Calcutta, on August 10, 1981.

Dr. V. Ramalingaswami, Director-General, ICMR, New Delhi, participated in the XII International Congress of Nutrition at San Diego, USA, between August 16-21, 1981. He presented a paper on Interventions to deal with Infections and Malnutrition in the Symposium on Nutritional Status and Susceptibility to Disease.

Dr. Vinodini Reddy, Deputy Director, National Institute of Nutrition, Hyderabad, also participated in the XII International Congress of Nutrition, where she chaired the symposium on Protein Energy Malnutrition and presented a paper in the symposium on Fat Soluble Vitamins.

New Appointments:

The following appointments have been made at the Tuberculosis Research Centre, Madras:-

- Dr. R. Prabhakar, Assistant Director as Deputy Director.
- Dr. N. Gopalakrishnan, Senior Research Officer as Assistant Director.

ICMR AIDED SYMPOSIA/SEMINARS/WORKSHOPS/CONFERENCES

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
Transcultural Psychiatric Meet.	August 23-25, 1981	Madurai Medical College, Madurai.
UNESCO-IBRO Workshop on New Techniques in Neurosciences with special reference to the Neurophysiology of Higher Nervous Activity.	August 30 - September 12, 1981	National Institute of Mental Health and Neurosciences, Bangalore.
Symposium on Leprosy.	September 9-12, 1981	Central Jalma Institute for Leprosy, Agra (Indian Association of Leprologists).
Virology Conference.	September 28-30, 1981	Central Potato Research Institute, Simla.
National Seminar on Health for All - A National Dialogue on Operational Aspects of Comprehensive Primary Health Care and Rural Development.	September, 1981	Birla Institute of Medical Research, Gwalior.
National Symposium on Cataract and Corneal Disasters.	October 12-17, 1981	Dr.Rajendra Prasad Centre for Ophthalmic Sciences, New Delhi.
4th All India Congress of Cytology and Genetics, 1981.	October 17-21, 1981	University of Bhagalpur, Bhagalpur.
First National Conference on Environmental Biopollution.	October 19-21, 1981	Marathwada University, Aurangabad (Indian Aerobiological Society).
Symposium on Fertility Control and Teratology.	October, 1981	JN Medical College, Aligarh Muslim University, Aligarh.
Seminar-cum-Workshop in Surgery for Postgraduates and Surgeons.	October 31 - November 1, 1981	All India Institute of Medical Sciences, New Delhi.

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
Second Workshop on *In vitro* Cultivation of Erythrocytic Forms of *P. falciparum* and Preparation of Antigens for Serology of Malaria.	November 2-15, 1981	Department of Microbiology, St. John's Medical College, Bangalore.
Conference on Industrial and Environmental Toxicology.	November 6-7, 1981	Industrial Toxicology Research Centre, Lucknow (Society of Toxicology, India).
Symposium on the Heart.	November 6-8, 1981	Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum (Indian Academy of Sciences).
Satellite Congress on Diabetes in the Young.	November 21-22, 1981	Ootacmund (The Coimbatore Branch of the Diabetes Association of India).
Symposium on Tropical Immunology.	November 23, 1981	Cancer Research Institute, Tata Memorial Centre, Bombay (Indian Immunology Society).
Seminar on Teaching and Research in Medical Sociology in India.	November, 1981	University of Jodhpur, Jodhpur.
International Symposium on Incidence of Infections and Chronic Diseases - Geographical Perspectives.	December 1-4, 1981	Department of Geography, University of Madras, Madras.
Symposia on Nutrition & Environment and Current Concepts in Membrane Biochemistry.	December 21-24, 1981	Department of Biochemistry, University College of Sciences, Calcutta.
International Workshop on Nutrition and the Development of the Child.	January 8-15, 1982	Department of Biochemistry, M.S. University, Baroda.

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(4) Certificate course in Statistical Techniques in Medical Research: (January 1982).

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(2) Laboratory Animal Technicians Training Course: (August 1 to September 30, 1981)

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Cell-Biology and Cyto-Genetics:

At the Indian Institute of Science Bangalore: (March, 1981).

Use of Radioisotopes in Medicine:

At the National Institute of Nutrition Hyderabad: (July, 1981).

Immunological Techniques:

At the Central Jalma Institute for Leprosy, Agra: (November, 1981).

Haematological Techniques:

*At the Department of Pathology, Christian Medical College, Vellore.

Clinical Endocrinology:

*At the Institute for Research in Reproduction, Bombay.

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*Dates to be announced later.

PROGRAMME OF SCIENTIFIC LECTURES AT THE INDIAN COUNCIL OF MEDICAL RESEARCH, NEW DELHI

Date	Topic	Speaker
10.9.1981	Immunological Aspects of Viral Hepatitis with particular reference to Immune Response against Liver Specific Protein (Basanti Devi Amir Chand Prize Oration, 1981)	Dr. N.C. Nayak, New Delhi.
24.9.1981	Evaluation of Methods for Fertility Regulation (Kshanika Award Oration, 1980)	Dr. K. Prema, Hyderabad.

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- Neurodiagnostic Aids	...	253 slides

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Nominations/applications are invited from distinguished retiring scientists engaged in research in the field of biomedicine for consideration for appointment as Emeritus Medical Scientists. Full particulars are obtainable from the Director-General, Indian Council of Medical Research, Post Box No.4508, Ansari Nagar, New Delhi-110029.

Last date for receipt of applications is *30th September, 1981*.

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C.F.T.R.I. MYSORE

CURRENT STATUS OF INHIBIN

Although much has been said about the need for a chemical contraceptive for the male, so far, not a single systemic male contraceptive has been developed and brought to the stage of serious clinical testing. Initially efforts were directed at interruption of spermatogenesis by chemical means. However, studies were hindered by the limited knowledge of male reproductive physiology and during the subsequent 30 years, the development of a male contraceptive did not advance beyond the confines of research laboratories.

Production of an azoospermic state would undoubtedly be the most effective means of male contraception. In several species, it is well documented that FSH regulates germinal cell function, while LH is concerned with testosterone production. Any agent which could selectively inhibit spermatogenesis by suppression of FSH without affecting androgen secretion from the testis would have potential use for male contraception. 'Inhibin' is a peptidic factor of gonadal origin that selectively and specifically lowers the rate of secretion of FSH.

In simple terms, two pituitary gonadotropins act on the testis, FSH stimulates the seminiferous tubules while LH stimulates the Leydig cells; the Leydig cells produce androgens (particularly testosterone) which control LH secretion by negative feedback and the seminiferous tubules produce inhibin which controls FSH secretion by negative feedback.

Evidence for Existence of Inhibin:

Circulating levels of FSH and LH have been found to be altered in certain pathologic conditions of the human testis. Serum FSH levels are elevated without altering LH and testosterone levels in patients with disturbance of spermatogenesis and normal Leydig cell function[1,2]. It was found that a substance produced by the seminiferous tubules was involved in the regulation of FSH secretion. The existence of such a substance was first postulated by McCullagh[3], who named it 'Inhibin'. Evidence for inhibin activity in human seminal plasma was shown by Franchimont[4]. Since FSH inhibiting activity was found in seminal plasma of normal and oligospermic men, but not in the semen of azoospermic patients, spermatids were postulated to be the most likely source of inhibin[4] Other investigators could not demonstrate a correlation between specific spermatogenic stages and serum FSH levels, which suggested that the Sertoli cells could be the cellular source of inhibin[5]. In the rat, it has been demonstrated that Sertoli cells in culture secrete a factor - Sertoli cell factor (SCF) - which selectively suppresses FSH production by cultured pituitary cells[6]. However, no direct evidence for secretion of an FSH inhibiting substance by the human Sertoli cell is available.

Interest in inhibin as a potential male contraceptive was stimulated by virtue of its

ability to suppress FSH secretion. However, reports over the last decade have merely established the existence of inhibin in gonadai secretion of several species without making any spectacular studies on its chemistry or physiology.

Interest in its physiological and biochemical properties nas resulted in the need for purification of inhibin in sufficient quantity. Various investigators have used different sources for inhibin extraction (Table).

SOURCES OF INHIBIN

Sources	Molecular weight	Investigators
Human seminal plasma	<5,000	Franchimont *et al*[7]
	19,000	Thakur *et al*[8]
Ovine rete testis fluid	<5,000 to >160,000	Baker *et al*[9]
Ovine testicular lymph	90,000	
	30,000	
Bovine seminal plasma	15,000 to 19,000	Chari *et al*[10] Sairam *et al*[11]
Ram testis	1,500	Sheth *et al*[12]

A variety of extraction methods have been used including some which might be expected to lead to a loss of low molecular weight substances, *e.g.* ethanol precipitation, charcoal treatment. The evidence from a number of groups that inhibin like activity is destroyed by heat and by enzymatic treatment with trypsin, pepsin or pronase, has established that the material is peptide or proteinaceous in nature. There is, however, considerable confusion regarding the molecular weight of the active material even when prepared by different investigators from the same starting material. This discrepancy has been attributed to polymer formation, association with a carrier protein or purification artifacts.

Measurement of Inhibin:

The evidence for the existence of inhibin which has been disputed since several investigators have been able to reverse completely the changes in gonadotropin levels which follow castration by the administration of steroids combinations, rests on various assay methods. Given the definition, the obvious response metameter for any biological assay is the reduction in FSH secretion, which can be measured indirectly by the assessment of a biological effect of FSH or directly by FSH assay. The major problem with inhibin assays is that of specificity; all the bioassays are based on suppression of FSH secretion and/or synthesis, which can be affected by a variety of cell toxins, or by other biologically active substances.

Using a homogeneous inhibin preparation of human origin (human seminal plasma) a sensitive and specific radioimmunoassay for inhibin[13] has been developed at the Institute for Research in Reproduction (IRR), Bombay. None of the purified hormones tested, such as LH, FSH and prolactin from different species showed any cross-reaction in this radioimmunoassay. Steroid hormones such as testosterone, dihydrotestosterone, estradiol 17β and progesterone did not interfere with the assay. Using this radioimmunoassay, inhibin has been measured in various biological fluids and tissues. Normospermic semen is found to contain significantly higher levels of inhibin than the oligospermic semen[14]. Similar results have been reported with bioassay (Berger *et al*. Personal communication).

Physiological Characterization of Inhibin:

The half-life of inhibin is much shorter in adult rats than in immature rats (2.4 min for adult rats and 90 min for immature rats). The metabolic clearance rate of inhibin is greater in adult rats as compared to the immature rats (0.12 ml/min in adult rats and 0.019 ml/min in immature rats). The slower clearance of inhibin in immature rats leads to longer half-life.

The levels of inhibin are much higher in immature rats as compared to adult rats[15]. Inhibition of FSH binding was more pronounced in immature rats as compared to the mature rat testicular receptor preparation at the same dose of inhibin[16]. The role of FSH in spermatogenesis indicates that the initiation of spermatogenesis at puberty and also the reinitiation of spermatogenic cycle in regressed testis requires the presence of FSH. It appears that inhibin may control puberty in men.

Half-life studies were carried out in castrated and testosterone treated groups with labelled inhibin. The half-life is prolonged in these two groups as compared to the intact rats. It is tempting to speculate that there are some testicular factors which shorten the half-life or affect the metabolism of inhibin. It is also postulated that inhibin acts in synergism with androgens in the male and estrogens in the female[17]. If so, then inhibin alone or in combination with steroids, can be used to bring about 80-90 per cent suppression of FSH.

Site of Action:

The *in vitro* evidence, from a number of laboratories indicates that inhibin preparations exert suppressive effects on FSH secretion by cultured pituitary cells of rats, while limited experiments in sheep also indicate that a major effect of inhibin contributing to its *in vivo* effect of lowering FSH levels, is a direct one on the pituitary gland. The effect is seen on basal release and cell content as well as on LHRH stimulated release.

Action at the testicular level has been postulated by Franchimont and co-workers[7]. IRR has provided the first experimental evidence of this by demonstrating that inhibin inhibits the binding of FSH to its testicular receptor[16,18,19].

Simultaneous incubation of inhibin and ovine FSH (6×10^{-8}M) with testicular slices resulted in reduction of cAMP accumulation as compared to controls. When testicular slices were incubated with inhibin the phosphodiesterase (PDE) activity was increased in a dose related manner. This suggests that the observed inhibition of cAMP accumulation is due to reduction in adenyl cyclase and/or increase in PDE activity. When inhibin was incubated in the presence of labelled hCG with testicular receptor, inhibin was unable to inhibit the binding of hCG to its receptor. This suggests that the observed inhibition with inhibin is specific to FSH. From the contraceptive point of view, this is advantageous because inhibin does not affect the LH action at the testicular level. Recently, Daume *et al.*,[20] have also reported the presence of a low molecular weight factor from human follicular fluid that inhibits *in vitro* binding of FSH to ovarian granulosa cells.

Other mechanisms of action may also be operating. Inhibin preparations have been found to decrease the endogenous LHRH content of isolated rat hypothalami after short term incubation[7]. Similarly, studies at the IRR have shown suppression of hypothalamic LHRH content on administration of low molecular weight testicular inhibin preparation to castrated adult male rats.

It may be difficult to correlate the effects on hypothalamic LHRH with the observed specificity of inhibin action on FSH release and the question must again be raised that more than one gonadal peptide is involved in gonadotropin regulation or that the hypothalamic effects represent a non-specific toxic effect. However, in a number of experimental situations, it has been shown that effects on LH release are earlier and of shorter duration than effects on FSH. This would be consistent with acute effects on LHRH with more prolonged effects on FSH synthesis.

Site of Synthesis:

The probable cell type responsible for inhibin production still remains controversial. The general view is that the Sertoli cells are the probable site of its synthesis in the testis. It has also been demonstrated in *in vitro* culture of pituitary and Sertoli cells[21,22]. However, Krenger *et al.*[23], have suggested that Sertoli cells in association with germ cells are responsible for inhibin production. Experimental evidence shows high amounts of bioactive and immunoreactive in-

hibin in enriched spermatid fraction obtained from rat testis extract (Sheth *et al.*, unpublished data). Recently, *in vitro* localization of inhibin in spermatid region has been shown by immunofluorescent technique (Arbatti *et al*, unpublished observations).

Role of Inhibin in Female:

Using identical extraction procedures, inhibin has been purified from sheep testis and ovaries[19].

Daily treatment of adult female or immature male rats for periods longer than 5 days did not result in prolonged suppression of circulating FSH concentrations, LH levels were significantly increased. Female rats showed cyclic vaginal smear changes and normal ovulation; in the male rat, testis weight and number of spermatogenic cells were reduced. It was, therefore, concluded that testicular and ovarian inhibin-like activities are similar. Injections of follicular fluid into male and female rats caused similar effects on FSH and LH. The effect of follicular fluid in unilateral ovariectomized animals suggests that inhibin could play a role in the short term regulation of the number of developing follicles in the ovary. Injection of follicular fluid into male rats caused a probably transient impairment of spermatogenesis through an initial suppression of FSH.

Erickson and Hsueh[24] have demonstrated that granulosa cell cultures secrete inhibin-like material which acts directly upon cultured pituitary cells. In view of the preclusive relationship that FSH has on granulosa cells, it would be physiologically meaningful for the specific target cell to provide a selective signal in the modulation of its trophic (FSH) secretion. Thus, an exclusive feedback control system of granulosa cell - FSH axis may operate through follicular inhibin. An inverse correlation between FSH inhibiting activity and follicular size has been observed[25]. Depalo and associates[26], employing an *in vitro* bioassay, used ovarian venous plasma to estimate inhibin activity. Similarities of inhibin of testicular and ovarian origin have been recently established[19]. It is not surprising that antigenic similarities were observed between 'female inhibin' and human seminal plasma 'male inhibin' as reflected by the parallel dose responses obtained in radioimmunoassay developed for human seminal plasma inhibin. Inhibin levels showed cyclic variations during menstrual cycles. In all the six cycles studied, an inhibin peak was observed during late follicular phase, 2 to 3 days earlier than the LH peak[27].

The role of FSH in the female is more pronounced as compared to the male. Preliminary studies from IRR, Bombay, on inhibin revealed that it has an anti-implantation effect in mice. It would thus appear that inhibin may be potentially useful for female contraception.

From the reported studies at IRR, Bombay, and other laboratories, it appears that inhibin perhaps exist in multiple forms. Since inhibin is a native hormone, toxicity will be minimal. From various studies, it has been shown that inhibin is capable of suppressing only 70-80 per cent of the FSH secretion. It is possible that inhibin and a steroid (estrogen or androgen) may be involved in the physiological regulation of FSH. To suppress completely circulating FSH levels, administration of either a combination of inhibin and a steroid or a powerful synthetic analogue of inhibin may be necessary. Studies at IRR, Bombay, have demonstrated the identical characteristics of male and female inhibin. Preliminary studies indicate the anti-implantational activity of inhibin.

Studies clearly indicate that inhibin has a very short half-life in the adult animal, which may be due to the involvement of other testicular factors. Apart from its possible contraceptive application in the male or the female, inhibin can help to understand the basic role of FSH in reproductive disorders. The availability of synthetic inhibin would certainly solve some of the existing controversies in this field.

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contributed by Dr. A.R.Sheth and colleagues of the Institute for Research in Reproduction, Bombay.

ABSTRACTS

Some Research Projects completed recently

Role of hypersensitivity in intestinal/hepatic amoebiasis

With a view to assess the role of specific amoebic and/or non-specific prior sensitization on the outcome of intestinal/hepatic amoebiasis this study was undertaken.

All the animals studied, became hypersensitive with monoaxenic amoebic antigen and developed fulminating caecal ulcers while approximately 13 per cent animals developed hepatic abscesses. Thirty eight per cent of the animals developed granulomatous lesions as well. Animals sensitized with axenic amoebic antigen showed protection in 30 per cent of animals; caecal lesions were seen in 70 per cent and hepatic lesions in 7 per cent animals. It seemed that axenic amoebic antigen could protect as well as make some of the animals hypersensitive depending upon the concentration of functional antigenic determinants. Animals sensitized with live amoebae developed lesions only in 20-30 per cent animals indicating that live amoebae act as better immunogen. Circulating antibodies seemed to have no role in protection as the animals with lesions had as high antibody titres as the infected animals without lesions. Cell mediated immune response was altered in animals with amoebic liver abscess.

In human studies analysis of the relationship between serum antibodies and the degree of macrophage inhibition did not show much correlation between the two parameters, indicating thereby that inhibition did not reflect the humoral antibody response.

V.K. Vinayak
Department of Experimental Medicine
Postgraduate Institute of Medical Education and Research
Chandigarh.

Publications:

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Effect of lipid composition on the virulence of Mycobacterium tuberculosis

The alterations in the lipid composition in response to low temperature and fatty acid supplementation in saprophytic avirulent and virulent strains of *M. tuberculosis* were studied. It was observed that total lipids

(total phospholipids as well as the glycerides) increase at lower growth temperature in *M. smegmatis 607* and *M. phlei* whereas in the pathogenic strain $H_{37}R_V$, total phospholipids were found to decrease. Among the individual phospholipid components, a general trend of decrease in phosphatidylinosotolmannosides and increase in phosphatidylethanolamine was observed. In addition, cardiolipin was found to increase significantly in *M. tuberculosis* $H_{37}R_V$. Unsaturated fatty acids showed a marked increase at low temperature. The supplementation of exogenous fatty acids produced complex changes with different fatty acids in different strains. No significant changes were observed in lipids of BCG strain (avirulent) under these conditions.

Comparison of human strain of $H_{37}R_V$ (isolated from human sputum) with the stock culture (NCTC London), revealed the presence of high contents of total lipids as well as total phospholipids in virulent human strains as compared to NCTC strain. It was also interesting to note that the total lipids of the human $H_{37}R_V$ strains increased significantly when the cells were grown in media supplemented with exogenous fatty acids.

Furthermore, virulence was observed to be related with the lipid composition of cells to some extent. *M. tuberculosis* $H_{37}R_V$ cells grown in the presence of palmitoleic acid were found to be more virulent than the control cells.

G.K. Khuller
Department of Biochemistry
Postgraduate Institute of
Medical Education and
Research
Chandigarh.

Publication:

Taneja, R., Malik, U. and Khuller, G.K. Effect of growth temperature on the lipid composition of *Mycobacterium smegmatis AICC 607*. *J Gen Microbiol 113:* 413, 1979.

SUMMARY OF THE BASANTI DEVI AMIR CHAND PRIZE (1981) ORATION

Dr. N.C. Nayak, Professor of Pathology, All India Institute of Medical Sciences, New Delhi, delivered the Basanti Devi Amir Chand Prize (1981) Oration on 'Immunological Aspects of Viral Hepatitis with Particular Reference to Immune Response against Liver Specific Protein' at the Indian Council of Medical Research, New Delhi, on September 10, 1981.

Infections with hepatitis viruses are responsible for the majority of acute and chronic hepatitis - health problems of considerable magnitude in India and the South-East Asia region. These viruses do not appear to be cytopathic and the mechanism of hepatocellular injury induced by them remains unknown. Immune reactions against the virus or against altered or normal cellular constituents subsequent to infection have been considered to have important bearing on the pathogenesis of hepatitis.

An attempt was made at the AIIMS, New Delhi, to explore the latter facet by investigating the role of immune responses against the specific liver cell membrane protein (LSP) in human patients and in mice. Antibodies to LSP circulating in blood as well as fixed on hepatocytes can be demonstrated not only in patients with acute and chronic hepatitis but also in those with some other liver diseases. Development of these antibodies appears to result from rather than causing liver injury.

High lymphocyte mediated hepatocytotoxicity is present in the first 3 weeks of jaundice due to acute hepatitis. The values touch control levels at around 6 weeks or later. Some patients including a few going on to chronicity show resurgence of cytotoxicity.

Mice immunised with rat LSP (1 or 2 doses) manifest both humoral and cellular immune response against this protein as measured by immunofluorescence and cytotoxicity (^{51}Cr release and morphologic cell loss) respectively. These reactions seem to have two humps, a small one at 3 to 4 weeks and a larger at 14 to 18 weeks. Histologically, there is lymphocytic infiltration in the liver parallel in intensity to the immune reactions, but no significant hepatocytic damage is seen.

It is concluded that even though LSP is actively immunogenic there is, as yet, no evidence to indicate a significant *in vivo* cytopathogenic role of anti LSP immune reactions in man or mouse.

ICMR NEWS

Advisory Group/Study Group meetings:

The following ICMR Advisory Group/Study Group meetings were held at the Council during the month:

Advisory Group on Maternal and Child Health	September 22-24, 1981
Study Group on Diarrhoeal Diseases and Acute Respiratory Diseases	September 28-29, 1981

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Dr. S.C. Pal, Director, National Institute of Cholera and Enteric Diseases, Calcutta, participated in the Steering Committee meeting of the WHO Scientific Working Group on Bacterial Enteric Infections held at Geneva between September 2-4, 1981. He also participated in the International Symposium on Recent Advances in Enteric Infections held at Brugge, Belgium, from September 8-11, 1981.

Dr. B.C. Deb, Deputy Director, National Institute of Cholera and Enteric Diseases, Calcutta, participated in a training course on Health Services Research Evaluation with emphasis on Diarrhoeal Diseases Control, held at Dacca, Bangladesh, between September 7-18, 1981.

Dr. V. Ramalingaswami, Director-General, Indian Council of Medical Research, New Delhi, inaugurated the XII Biennial Conference of the Indian Association of Leprologists at Agra on September 9, 1981.

Dr. S.P. Tripathy, Director, Tuberculosis Research Centre, Madras, participated in the meeting of the WHO/IUAT Joint Study Group on Tuberculosis Control at Geneva between September 14-18, 1981.

Dr. V. Ramalingaswami participated in the meeting of the Scientific and Technical Advisory Committee of the WHO Special Programme for Research and Training in Tropical Diseases at Geneva between September 15-19, 1981. He also participated in the meeting of the WHO ACMR Sub-Committee on Cancer, between September 28-30, 1981.

Dr. Usha K. Luthra, Senior Deputy Director-General, ICMR, visited various centres of Cytology/Cytopathology in the USSR between September 15-22, 1981.

New Appointments:

Dr. A.J. Baxi, Assistant Director, Blood Group Reference Centre, Bombay, has been appointed as Deputy Director at the Centre.

ICMR AIDED SYMPOSIA/SEMINARS/WORKSHOPS/CONFERENCES

Symposium/Seminar/Workshop/Conference	Date	Institution/Department
Workshop on Scientific Methods in Morphosciences.	August/September, 1981	Department of Anatomy, Maulana Azad Medical College, New Delhi (Delhi Association of Morphological Sciences).
UNESCO-IBRO Workshop on New Techniques in Neurosciences with special reference to the Neurophysiology of Higher Nervous Activity.	August 30 - September 12, 1981	National Institute of Mental Health and Neurosciences, Bangalore.
Symposium on Science,Technology and Society.	September 7-12, 1981	Bombay (Indian Women Scientists Association).

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
Symposium on Leprosy.	September 9-12, 1981	Central Jalma Institute for Leprosy, Agra (Indian Association of Leprologists).
Workshop on Gastrointestinal Endoscopy.	September 19, 1981	Department of Gastroenterology, Medical College, Trivandrum (Society of Gastrointestinal Endoscopy of India).
Seminar on Involvement of Medical Colleges/Institutions in the Delivery of Comprehensive Health Care to the Rural Community.	September 25-27, 1981	Medical College, Nagpur.
Third National Conference on Drug Abuse.	September 28 - October 1, 1981	Department of Psychiatry, All India Institute of Medical Sciences, New Delhi.
Symposium on Fertility Control and Teratology.	October 3, 1981	JN Medical College, Aligarh Muslim University, Aligarh.
Symposium on Regulation of Fertility.	October 3-5, 1981	School of Life Sciences, University of Hyderabad, Hyderabad (Endocrine Society of India).
National Symposium on Cataract and Corneal Disasters.	October 12-17, 1981	Dr.Rajendra Prasad Centre for Ophthalmic Sciences, New Delhi.
4th All India Congress of Cytology and Genetics, 1981.	October 17-21, 1981	University of Bhagalpur, Bhagalpur.
First National Conference on Environmental Biopollution.	October 19-21, 1981	Marathwada University, Aurangabad (Indian Aerobiological Society).
Seminar-cum-Workshop in Surgery for Postgraduates and Surgeons.	October 31 - November 1, 1981	All India Institute of Medical Sciences, New Delhi.
Second Workshop on *In vitro* Cultivation of Erythrocytic Forms of *P. falciparum* and Preparation of Antigens for Serology of Malaria.	November 2-15, 1981	Department of Microbiology, St. John's Medical College, Bangalore.
Conference on Industrial and Environmental Toxicology.	November 6-7, 1981	Industrial Toxicology Research Centre, Lucknow (Society of Toxicology, India).

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
Symposium on the Heart.	November 6-8, 1981	Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum (Indian Academy of Sciences).
Satellite Congress on Diabetes in the Young.	November 21-22, 1981	Ootacamund(The Coimbatore Branch of the Diabetes Association of India).
Symposium on Tropical Immunology.	November 23, 1981	Cancer Research Institute, Tata Memorial Centre, Bombay (Indian Immunology Society).
International Symposium on Early Diagnosis and Prevention of Disability.	November 26-28, 1981	Department of Pediatrics, B.J. Medical College, Pune (Indian Society of Human Genetics).
Seminar on Teaching and Research in Medical Sociology in India.	November, 1981	University of Jodhpur, Jodhpur.
International Symposium on Incidence of Infections and Chronic Diseases - Geographical Perspectives.	December 1-4, 1981	Department of Geography, University of Madras, Madras.
National Seminar on Health for All - A National Dialogue on Operational Aspects of Comprehensive Primary Health Care and Rural Development.	December 12-13, 1981	Birla Institute of Medical Research, Gwalior.
International Conference on the Applications of Mossbauer Effect.	December 14-18, 1981	Jaipur (Indian National Science Academy).
Symposia on Nutrition & Environment and Current Concepts in Membrane Biochemistry.	December 21-24, 1981	Department of Biochemistry, University College of Sciences,Calcutta.
30th Annual Conference of the Anatomical Society of India.	December 28-30, 1981	Gandhi Medical College, Bhopal.
International Workshop on Nutrition and the Development of the Child.	January 8-15, 1982	Department of Biochemistry, M.S. University, Baroda.
Workshop on Evaluation of Mutagenic Potential of Environmental Agents: Microbial and Mammalian Systems.	February 15-19, 1982	Division of Biochemistry and Food Technology, Bhabha Atomic Research Centre, Bombay (Environmental Mutagen Society of India).

PROGRAMME OF SCIENTIFIC LECTURES AT THE INDIAN COUNCIL OF MEDICAL RESEARCH, NEW DELHI

Date	Topic	Speaker
10.9.1981	Immunological Aspects of Viral Hepatitis with particular reference to Immune Response against Liver Specific Protein (Basanti Devi Amir Chand Prize Oration,1981)	Dr. N.C. Nayak, New Delhi
24.9.1981	Influenza.the Perennial Scourge: A Challenge to Mankind by a Changing Virus (Dr. J.B. Srivastav Oration, 1981)	Dr. B. Lalitha Rao, Pune.
29.10.1981	Evaluation of Methods for Fertility Regulation (Kshanika Oration Award, 1980)	Dr. K. Prema, Hyderabad.

COUNCIL'S TRAINING PROGRAMMES FOR 1981

Leprosy:

At the Central Jalma Institute for Leprosy, Agra:

Training course in Leprosy for medical officers: (February 15 to March 28, 1981, and August 31 to October 14, 1981).

Virology:

At the National Institute of Virology, Pune:

(1) Diploma course in Medical Virology of Poona University: (July,1981).

(2) *Workshop on Japanese Encephalitis in India.

Endocrinology:

At the National Institute of Nutrition, Hyderabad:

Annual certificate course in Endocrinological Techniques and their Application: (August to September, 1981).

Nutrition:

At the National Institute of Nutrition, Hyderabad:

(1) Annual certificate course in Human Nutrition for teachers from Agricultural Universities: (June/July, 1981).

(2) M.Sc. (Applied Nutrition) course:(June 1, 1981 to February 28, 1982).

(3) Annual certificate course in Public Health Nutrition:(October/November,1981).

(4) Annual certificate course in Nutrition: (December 1, 1981 to February 28, 1982).

Haematology:

At the Blood Group Reference Centre, Bombay:

(1) A certificate course in Blood Banking Technology and Basic Haematology for medical officers: (February 1 to March 15, 1981).

(2) Training course in Blood Banking Methodology for technicians: (May 12-26, 1981).

Mental Health:

At Bangalore, Chandigarh and Delhi:

Training course on Extension of Mental Health Services in the Community: (July, 18 - August 29, 1981).

Occupational Health:

At the National Institute of Occupational Health, Ahmedabad:

NIOH/WHO Training Course on Air Pollution and Health: (December 1-10, 1981).

Oncology:

At the Cancer Research Institute, Tata Memorial Centre, Bombay:

Training course on Carcinogenicity, Mutagenicity and Teratogenicity: (December, 1981).

Clinical Pharmacology:

*At the Department of Pharmacology, Seth G.S. Medical College, Bombay.

Biostatistics:

At the Institute for Research in Medical Statistics, New Delhi:

(1) Certificate course in Planning and Evaluation of Health Programmes: (April,1981).

(2) Diploma course in Biostatistics: (September, 1981).

(3) Certificate course in Orientation to Biostatistics: (September, 1981).

(4) Certificate course in Statistical Techniques in Medical Research: (January, 1982).

Laboratory Animal Technology:

At the National Institute of Nutrition, Hyderabad:

(1) Laboratory Animal Supervisors Training Course: (January 2 to March 31, 1981).

(2) Laboratory Animal Technicians Training Course: (August 1 to September 30, 1981).

COURSES FOR TALENT SEARCH SCHEME FELLOWS

Cell-Biology and Cyto-Genetics:

At the Indian Institute of Science, Bangalore: (March, 1981).

Use of Radioisotopes in Medicine:

At the National Institute of Nutrition, Hyderabad: (July, 1981).

Immunological Techniques:

At the Central Jalma Institute for Leprosy, Agra: (November, 1981).

Haematological Techniques:

*At the Department of Pathology, Christian Medical College, Vellore.

Clinical Endocrinology:

*At the Institute for Research in Reproduction, Bombay.

*Dates to be announced later.

SOME ICMR PUBLICATIONS

	Price Rs.
Menus for Low-Cost Balanced Diets and School Lunch Programmes suitable for South India (1959), Third Edition 1977, Reprinted 1978	1.50
Menus for Low-Cost Balanced Diets and School Lunch Programmes suitable for North India (1959), Second Edition 1977	1.50
Nutrition for Mother and Child (1962), Third Edition 1978	4.50
Some Common Indian Recipes and Their Nutritive Value (1964), Fourth Edition 1977, Reprinted 1980	6.50
Nutritive Value of Indian Foods (1971), Reprinted 1981	9.00
Dietary Allowances for Indians (1971), Reprinted 1980	5.50
Diet Atlas of India (1971)	8.00
Nutrition Atlas of India (1971)	10.50

	Price Rs.
Atlas of Histopathology of Liver: Hepatitis and Cirrhosis (1974)	10.00
Studies on Pre-School Children (1974), Reprinted 1977	3.50
Studies on Weaning and Supplementary Foods (1974), Reprinted 1977	4.00
Medicinal Plants of India Vol. I (1976)	30.00
Research in Malaria - An Outline (1977)	Gratis
Health Hazards of Mycotoxins in India (1978)	5.00
Japanese Encephalitis in India, Revised Edition 1980	5.00
Recommended Dietary Intakes for Indians (1981)	4.00

These publications are available on prepayment of cost by cheque or postal order (postal charges will be extra) drawn in favour of the Director-General, Indian Council of Medical Research, New Delhi. Money orders are not acceptable. All correspondence in this regard should be addressed to the Chief, Division of Publication and Information, Indian Council of Medical Research, Post Box 4508, Ansari Nagar, New Delhi-110029.

TISSUE CULTURE

A Workshop on "Animal Cell Culture and Differentiation" (November 20 - December 15, 1981) will be held at the Department of Zoology, University of Poona, Pune, in collaboration with the National Institute of Virology, Pune.

Prof. S.P. Modak, Department of Zoology, University of Poona, Pune-411007, may be contacted for details on or before 3rd October, 1981.

RADIOIMMUNOASSAY KITS AVAILABLE

The reagents listed below (procured under the Indo-US Sub-Commission Programme) are available at the Reagent Bank, Institute for Research in Reproduction, Bombay, in limited quantities, free of charge, to qualified investigators for research and diagnostic purposes only:

RIA Kits:

Human	Rat	Subhuman
h TSH	r LH	primate pregnancy
h LH		test kits
h FSH	r FSH	
h GH		
h CG	r Prol	
B hCG		

Supplies of these materials may be obtained on request from the Director, Institute for Research in Reproduction, Parel, Bombay-400 012, with a copy endorsed to the Director-General, ICMR, Ansari Nagar, New Delhi-110029. The request must include: (i) A description of the proposed use of the materials, to justify the kind and amount of request; (ii) experience with RIA; and (iii) a progress report and/or recent publication of results from materials previously supplied by the Reagent Bank, if any.

Only one vial, or one kit (one kit = one vial of antigen (50 ug) and one vial of antiserum) of the reagents, animal or human for RIA will be supplied at a time. Request for larger amounts may also be considered.

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ICMR BULLETIN

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CFTRI

DISRUPTION OF PREGNANCY IN MICE BY ANTIBODIES TO GONADOTROPINS

The past decade has witnessed a precipitous rise in the use of immunologic techniques in reproductive biology. Recent studies have shown that it is possible to utilize antibodies to hormones in *in vitro* situations which make it possible to discriminate the biological action of specific hormones in an intact animal in general, and their effects on the target organ, in particular.

The use of antisera to gonadotropins as a tool for biological studies was initiated at the Institute for Research in Reproduction (IRR), Bombay, in the early sixties. This approach has been used to specifically study the hormonal requirement for the maintenance of pregnancy at various stages in the mouse. Antibodies were successfully raised in rabbits against human chorionic gonadotrophin[1], ovine follicle stimulating hormone[2-4], ovine luteinizing hormone[5,6], ovine prolactin[7] and their antigenic composition characterised[8,9].

The extensive work done at the IRR, Bombay, on antibodies to luteinizing hormone is reviewed here. The effects of *in vivo* neutralization of circulating luteinizing hormone (LH) by antibodies, on the reproductive processes in the female Swiss mouse have been studied. The role of LH in the control of implantation and the maintenance of pregnancy in mice has been evaluated. The antibodies were injected directly into the animals.

In the use of antibodies to neutralize the biological effects of gonadotropins *in vivo*, the possibility that the most specific antiserum may not be the best in a biological system must be considered. A suitable biological system, used at the IRR to demonstrate the inhibitory properties of antibodies to LH was the ventral prostate weight assay using immature male rats[6]. Approximately, 1.0 ml of the antiserum was able to inhibit the increase in ventral prostate weight induced by 1.6 mg of LH from ovine, bovine and porcine sources. In another biological system, it was shown that antibodies to LH were able to disrupt normal estrus cycles in regularly cycling mice and cause a decrease in the weights of the reproductive organs[6].

Pregnant mice were passively immunized with antibodies to LH at various times during pregnancy. The effects of such immunizations on implantation and maintenance of pregnancy were studied.

Results from antibody administration on various days, 1 to 4 or 6 to 8, of pregnancy indicate that LH plays a role in the events leading to implantation and the maintenance of pregnancy[6]. In untreated control mice, days 1 to 3 and part of day 4 comprise the period of oviductal passage of ova. During the remainder of day 4 and day 5, the blastocysts lie free in the uterine cavity. Implantation of the blastocysts occurs on day 6 in the morning and on days 7 and 8 decidualization takes place.

Female mice injected with antiserum to LH on days 1 to 4 of gestation failed to

Division of Publication & Information, ICMR, New Delhi-110 029

become pregnant. Instead, they entered a state of pseudopregnancy of 12 days duration, after which normal estrus cycles were established. Antiserum injected on days 6 to 8 caused all implantation sites to be resorbed, and not a single pregnancy was carried to term. This inhibitory action of the antiserum was not due to the blocking of the estrogen surge from the ovary which is known to occur prior to implantation. Mice injected with antiserum to LH alone or in combination with estradiol on day 3 of pregnancy, failed to maintain pregnancy.

LH plays an equally important role in maintaining corpus luteum function during implantation in the intact mouse[10]. The administration of antibodies to LH on day 4 of pregnancy or pseduopregnancy inhibited implantation and decidual cell reaction respectively. Progesterone administered at the same time as the antiserum, was able to overcome the inhibitory effects of the antibodies to LH. These results indicate that the anti-implantation activity of the LH antiserum is manifested by its inhibition of progesterone synthesis by the corpus luteum.

These studies, however, failed to indicate at what stage pregnancy was affected. Since the various stages of pregnancy differ morphologically, microscopy was used to examine the early stages of pregnancy in mice injected with antiserum to LH in order to find out when pregnancy was affected[11]. In untreated control mice, implantation starts as an attachment of the blastocyst to the uterine epithelium followed by a trophoblastic invasion of the endometrium. The attachment reaction of the uterine epithelium obliterates the uterine lumen. Implantation is said to be completed when the uterine epithelium degenerates. The trophoblast cells then invade the endometrium and the stromal cells transform into decidual cells.

Results of studies at the IRR, indicated that a single injection of antiserum to LH, although capable of inhibiting pregnancy in the mouse, did not prevent the blastocysts from implanting, nor did such treatment block the shift in mitotic activity from epithelial to stromal cells in the uterus of mice on day 4 of pregnancy[12]. The change in the pattern of cell division in normal pregnancy is brought about by the secretion of progesterone and is considered to be an important factor in the preparation of the uterus for implantation.

The experiments described so far indicate that no morphological change is evident in the implanting blastocyst or the immediate surrounding uterine tissue in mice deprived of LH. Nevertheless, termination of pregnancy occurred on day 8 of gestation due to massive haemorrhage in the decidua. An attempt was, therefore, made to study whether enzymic changes induced in the implanting blastocyst and decidual tissue of antiserum treated mice would give an indication of disruption of pregnancy[13,14]

It is well established that alkaline and acid phosphatases are associated with the decidual cell reaction and play an important role in implantation. A marked increase in protein synthesis occurs in the uterus on day 4 of pregnancy in the mouse. This is accompained by a 10 to 17 fold increase in the activity of alkaline phosphatase in the decidual tissue at the site of implantation. These changes indicate the preparation of the endometrium for implantation of the arriving blastocyst, and suggest that alkaline phosphatase is an important marker enzyme for the decidual cell reaction and could be intimately associated with implantation. Acid phosphatase, which has been shown to increase on day 6 of pregnancy, is associated with the breakdown and phagocytosis of the luminal epithelial cells at the site of implantation.

In uninjected control mice on day 6 and 7 of gestation, the increase in wet weight and total protein content of the uterus was associated with an increase in the phosphatase activities in the implantation site[13,14]. However, in mice injected with antiserum to LH, a decrease in total protein and uterine weight was observed. This was accompanied by a concurrent decrease in alkaline phosphatase and increase in acid phosphatase levels when measured biochemically and compared to the respective controls on days 6 to 8 of pregnancy. The changes were, however, evident histochemically only on day 8 of pregnancy. The changes observed in the two phosphatases reflect decidual cell regression.

Alkaline phosphatase plays an important role in transfering metabolites across the cell membrane. Its high activity in the decidual tissue, associated with high protein synthesis, reflects its nutritive role in the developing blastocyst and thereby helps in the maintenance of pregnancy. Decrease in alkaline phosphatase activity, together with a decrease in total protein in antiserum injected animals suggests deprivation of nutrient

material to the blastocyst, inhibiting its growth and survival and results in the termination of pregnancy. Acid phosphatase is a lysosomal enzyme associated with the breakdown and phagocytosis of tissue. The significant increase in acid phosphatase activity in the antiserum treated mice would indicate enhanced phagocytosis of the luminal epithelial cells accompained by degeneration of the growing blastocyst and the termination of pregnancy.

The results described here illustrate the usefulness of gonadotropin antibodies as a tool in the study of early embryo-endometrial relationships - which are vulnerable for disruption of pregnancy. Any compound that interferes at the earliest possible stage after fertilization, would be a useful tool constituting a direct approach towards the control of early pregnancy.

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Contributed by Dr. S.R. Munshi and colleagues, based on studies conducted at the Institute for Research in Reproduction, Bombay.

ABSTRACTS

Some Research Projects completed recently

Acute transverse myelitis of non-compressive origin

Study was conducted to determine the aetiology and pathology of acute transverse myelitis (ATM) and the clinical features which provide a guide to its prognosis. Forty five cases of ATM in whom compression and trauma were excluded, have been studied prospectively for 2-3 years. It was seen that in 24 cases

the syndrome was associated with a systemic infection. Seventeen of 45 cases had a viral like illness preceding the onset, one case each followed mumps, infective hepatitis and anti-rabies inoculation. There were two cases of syphilitic myelitis. Other contributing factors were vitamin B_{12} neuro-myelopathy (one case) and leukemia (one case). Four cases subsequently developed lesions at other levels of the nervous system suggestive of multiple sclerosis.

More than 1/3 of the cases had pleocytosis in the CSF. An isolated elevation of CSF protein was seen in three cases. The CSF IgG was elevated in 9 of 27 cases where it was estimated. Viral studies were done on the sera, and CF antibodies to mumps, herpes, varicella-zoster and rabies and HI antibodies to measles were tested. Only one case showed a convincingly positive test to mumps.

Eighteen patients improved completely, 14 others could walk with aid, while 9 were bed/chair-ridden with persistent incontinence. A poor outcome was characteristic of cases with persistent spinal shock. Three patients died. Autopsy on one of them, a patient with a clinical picture of DeVic's disease, revealed discrete areas of perivenous myelinoclasis, axon loss and gitter cell replacement. Another showed degenerative changes in the posterior and lateral columns from T 3-5 segments, with predominant spongy degeneration of the white columns, suggesting an ischemic cause, or a remote effect of cancer - this patient having metastases in the liver from a possible primary carcinoma in the lung.

In a young girl development of myelopathy during a remission of acute leukemia with subsequent complete remission and a picture of Brown-Sequard syndrome of motor and sensory deficit, suggested that this was a vascular occlusion rather than a carcinomatous necrotic myelopathy. There was one unusual case of rapidly progressive B_{12} deficiency myelopathy in a young man who recovered after administration of vitamin B_{12}.

In the remaining 17 cases there was no aetiological factor to explain the development of myelitis.

E.P. Bharucha
Department of Neurology
Bombay Hospital
Bombay.

Membrane studies of erythrocytes and muscles in human muscle disorders with special reference to Duchenne muscular dystrophy

Studies were undertaken to assess the membrane function in Duchenne muscular dystrophy (DMD), a sex-linked recessive disorder, which is thought to result from generalized membrane defect. The sialic acid content, $Na^+ - K^+ - Mg^{++}$ - ATPase, 5' - nucleotidase activity and sodium dodecyl sulphate polyacrylamide gel electrophoretic (SDS-PAGE) protein profile of the erythrocytes and muscle membranes of normal individuals and DMD patients were studied to assess the membrane function. The activities of certain lysosomal enzymes like β-D-glucuronidase, alkaline ribonuclease, phosphodiesterase I and nucleotide pyrophosphatase were also estimated to monitor the purity of cellular membranes prepared. No detectable activity of lysosomal enzymes was observed in any of the membrane preparations, indicating their purity. Sialic acid content, $Na^+ - K^+ - Mg^{++}$ - ATPase and 5' - nucleotidase activities in both erythrocytes and muscle membranes from DMD patients did not differ from normal. SDS-PAGE protein of muscle membranes also did not show any appreciable change from normal controls, however, erythrocytic membranes showed increased SDS-PAGE protein. It has been suggested that certain acidic proteases which are known to be increased in DMD muscles might also be induced in the dystrophic RBC membranes resulting in altered protein pattern. The protein abnormality so produced may lead to the membrane defect in DMD.

Anil D. Desai
Department of Neurosurgery
Seth G.S. Medical College
and KEM Hospital
Bombay.

SUMMARY OF THE DR. J. B. SHRIVASTAV LECTURE (1981)

Dr. B. Lalitha Rao, Senior Research Officer, National Institute of Virology, Pune, delivered the Dr. J.B. Shrivastav Lecture (1981) on Influenza the Perennial Scourge: A Challenge to Mankind by a Changing Virus at the Indian Council of Medical Research, New Delhi, on September 24 1981.

Acute respiratory disease is one of the commonest causes of mortality and morbidity

all over the world and the resultant debility and economic loss is colossal. Viruses outnumber bacteria as the aetiological agents in most of these infections. Although a vast array of viruses are incriminated in respiratory infections, influenza viruses stand out amongst them in causing perennial epidemics and periodic pandemics affecting a large segment of the world's population within a brief period of time. There are three types of influenza virus: A, B and C. Of these, type A is the most important as it causes frequent epidemics and pandemics due to antigenic variation. It also causes natural infections in pigs, horses and birds. A variety of fascinating hypotheses have been suggested to explain the uniqueness of the virus.

Influenza is considered as one of the major communicable diseases constantly plaguing mankind, with no effective control measures in sight and hence a disease of great medical and public health importance. Considering the magnitude of the problem the WHO initiated three decades ago, a network of surveillance centres all over the world for early detection of newly emerging variant strains and to alert the health authorities of imminent explosive epidemics and pandemics. Such information gathered through surveillance becomes vital as the health authorities will at least know where they stand and what can be done in dealing with an explosive global disease like influenza as and when it strikes. It also provides the base line data for further research on influenza.

Influenza studies at the National Institute of Virology (NIV), Pune, were started in 1976 to investigate human as well as zoonotic aspects of the disease. In 1980, the laboratory at the NIV was recognized as the National Influenza Centre by the WHO. During the course of six years (1976-81), epidemics of influenza in humans in Pune were investigated almost every year and in the years 1980 and 81 twin epidemics were investigated. Thousands of influenza cases were seen and a large number of variant strains of type A influenza virus consisting of subtypes H3N2 and H1N1 and type B were isolated. From 1976 to 1981 there has been a progressive increase in the number of influenza cases and virus isolations. One of the influenza strains, A/India/6263/80 (H1N1), isolated during the July 1980 outbreak in Pune has been found to be a variant strain by the WHO Reference Centre at Atlanta, USA, and it is at present being used as a prototype reference strain by the WHO.

Observations have also been made on the occurrence of influenza epidemics in association with change of climatic conditions during each season of the year in Pune which has a tropical monsoon climate. So far, information available on the seasonality of influenza in tropical countries is scanty.

During 1981, studies on Reye's syndrome have been initiated and a serologic diagnosis of influenza B was made in a case of Reye's syndrome in Pune during an outbreak of influenza B.

Information gathered through serological surveys is promptly communicated and reported in the WHO weekly epidemiological records.

Zoonotic studies conducted at Pune have shown the prevalence of antibodies to human influenza strains in some species of animals and a bird influenza strain was isolated from a duck from Tirunelveli.

The success of communicable disease surveillance depends more on the energy, interest, enthusiasm and organizational capability of those who carry out the work than on the system itself. It is true for any field of study but more pertinent for this field.

ICMR NEWS

Advisory Committee/Expert Group Meetings:

The following Scientific Advisory Committees of Institutes/Centres of the Council met during the month:

National Institute of Occupational Health, Ahmedabad.	October 5, 1981
Cytology Research Centre, New Delhi.	October 19, 1981
Central Jalma Institute for Leprosy, Agra.	October 21, 1981

The following ICMR Advisory Committees/ Study Groups met during the month:

Study Group on Acute Haemorrhagic Conjunctivitis	October 17, 1981
Advisory Committee on Dental Health	October 23-24, 1981
Toxicology Review Panel	October 29-30, 1981

*** *** ***

A FAO/WHO/DGHS/NIN sponsored workshop on 'National Strategy for Food Quality Control' was held at the National Institute of Nutrition, Hyderabad, on October 12, 1981.

A workshop on 'Improving Availability of Contraceptive Methods' was held at the Indian Council of Medical Research, New Delhi, on October 27-28, 1981.

*** *** ***

Dr. H.M. Bhatia, Director, Blood Group Reference Centre, Bombay, visited, as a member of a Team of Indian Haematologists the relevant centres in the field in the USSR between September 20 and October 3, 1981.

Dr. V. Ramalingaswami, Director-General, ICMR, delivered the Gandhi Memorial Lecture on 'The Fight against Leprosy - from Despair to Hope' at Bangalore on October 2, 1981.

Dr. Badri N. Saxena, Sr. Dy. Director-General, ICMR, participated in a meeting of the International Committee on 'Contraception Research' held in New York from October 5-9, 1981. He also participated in a Steering Committee Meeting of the WHO Task Force on the Assessment of Safety of Long-acting Injectable Agents' held at Geneva between October 15-16, 1981.

Dr. P.G. Tulpule, Director, National Institute of Nutrition, Hyderabad, participated in the 81 International Symposium on 'Toxic Micro-organisms' held at Tokyo from October 6-8, 1981.

Dr. V. Ramalingaswami participated in a meeting of the WHO Advisory Committee on Medical Research held at Geneva between October 12-15, 1981.

Dr. P.K. Rajagopalan, Director, Vector Control Research Centre, Pondicherry, participated in the meeting of the Scientific Working Group on the 'Biological Control of Vectors' held at Geneva between October 12-16, 1981. He also participated in the Steering Committee Meeting held between October 19-23, 1981.

Dr. S. Sriramachari, Director, Institute of Pathology, New Delhi, participated in a meeting of producers of Health Learning Materials in relation to the Inter-regional Health Learning Materials programme held at Geneva between October 19-23, 1981.

Dr. S.K. Chatterjee, Director, National Institute of Occupational Health, Ahmedabad, participated in the GEMS/UNEP workshop on 'Exposure Monitoring' held at Las Vegas, Nevada, USA, between October 19-23, 1981.

Dr. K.V. Desikan, Director, Central Jalma Institute for Leprosy, Agra, has proceeded on a WHO short term consultancy to assist the National Project on Leprosy Control at Kathmandu, Nepal.

ICMR AIDED SYMPOSIA/SEMINARS/WORKSHOPS/CONFERENCES

Symposium/Seminar/Workshop/Conference	Date	Institution/Department
Third National Conference on Drug Abuse.	September 28 - October 1, 1981	Department of Psychiatry, All India Institute of Medical Sciences, New Delhi.
Symposium on Fertility Control and Teratology.	October 3, 1981	JN Medical College, Aligarh Muslim University, Aligarh.
Symposium on Regulation of Fertility.	October 3-5, 1981	School of Life Sciences, University of Hyderabad, Hyderabad (Endocrine Society of India).

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
ational Symposium on Cataract and orneal Disasters.	October 12-17, 1981	Dr.Rajendra Prasad Centre for Ophthalmic Sciences, New Delhi.
th All India Congress of Cytology nd Genetics, 1981.	October 17-21, 1981	University of Bhagalpur, Bhagalpur.
irst National Conference on Environ-ental Biopollution.	October 19-21, 1981	Marathwada University, Aurangabad (Indian Aerobiological Society).
eminar-cum-Workshop in Surgery for ostgraduates and Surgeons.	October 31 - November 1, 1981	All India Institute of Medical Sciences, New Delhi.
econd Workshop on *In vitro* Culti-ation of Erythrocytic Forms of *P. alciparum* and Preparation of Anti-ens for Serology of Malaria.	November 2-15, 1981	Department of Microbiology, St. John's Medical College, Bangalore.
onference on Industrial and Environ-ental Toxicology.	November 6-7, 1981	Industrial Toxicology Research Centre, Lucknow (Society of Toxicology, India).
ymposium on the Heart.	November 6-8, 1981	Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum (Indian Academy of Sciences).
atellite Congress on Diabetes in the oung.	November 21-22, 1981	Ootacamund(The Coimbatore Branch of the Diabetes Association of India).
ymposium on Tropical Immunology.	November 23, 1981	Cancer Research Institute, Tata Memorial Centre, Bombay (Indian Immunology Society).
nternational Symposium on Early iagnosis and Prevention of Disabi-ity.	November 26-28, 1981	Department of Pediatrics, B.J. Medical College, Pune (Indian Society of Human Genetics).
Seminar on Teaching and Research in Medical Sociology in India.	November, 1981	University of Jodhpur, Jodhpur.
International Symposium on Incidence of Infections and Chronic Diseases - Geographical Perspectives.	December 1-4, 1981	Department of Geography, University of Madras, Madras.
National Seminar on Health for All - A National Dialogue on Operational Aspects of Comprehensive Primary Health Care and Rural Development.	December 12-13, 1981	Birla Institute of Medical Research, Gwalior.

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
International Conference on the Applications of Mossbauer Effect.	December 14-18, 1981	Jaipur (Indian National Science Academy).
Symposia on Nutrition & Environment and Current Concepts in Membrane Biochemistry.	December 21-24, 1981	Department of Biochemistry, University College of Sciences, Calcutta.
30th Annual Conference of the Anatomical Society of India.	December 28-30, 1981	Gandhi Medical College, Bhopal.
International Workshop on Nutrition and the Development of the Child.	January 8-15, 1982	Department of Biochemistry, M.S. University, Baroda.
Workshop on Evaluation of Mutagenic Potential of Environmental Agents: Microbial and Mammalian Systems.	February 15-19, 1982	Division of Biochemistry and Food Technology, Bhabha Atomic Research Centre, Bombay (Environmental Mutagen Society of India).

PROGRAMME OF SCIENTIFIC LECTURES AT THE INDIAN COUNCIL OF MEDICAL RESEARCH, NEW DELHI

Date	Topic	Speaker
29.10.1981	Evaluation of Methods for Fertility Regulation (Kshanika Oration Award, 1980)	Dr. K. Prema, Hyderabad.
26.11.1981	Eradication of Smallpox from India (Dr. M.K. Seshadri Prize 1980)	Dr. R.N. Basu, New Delhi.

COUNCIL'S TRAINING PROGRAMMES FOR 1981

Leprosy:

At the Central Jalma Institute for Leprosy, Agra:

Training course in Leprosy for medical officers: (February 15 to March 28, 1981, and August 31 to October 14, 1981).

Virology:

At the National Institute of Virology, Pune:

(1) Diploma course .in Medical Virology o Poona University: (July,1981).

(2) *Workshop on Japanese Encephalitis i India.

Endocrinology:

At the National Institute of Nutrition Hyderabad:

Annual certificate course in Endocrino logical Techniques and their Application (August to September, 1981).

Nutrition:

At the National Institute of Nutrition, Hyderabad:

(1) Annual certificate course in Human Nutrition for teachers from Agricultural Universities: (June/July, 1981).

(2) M.Sc. (Applied Nutrition) course: (June 1, 1981 to February 28, 1982).

(3) Annual certificate course in Public Health Nutrition: (October/November, 1981).

(4) Annual certificate course in Nutrition: (December 1, 1981 to February 28, 1982).

Haematology:

At the Blood Group Reference Centre, Bombay:

(1) A certificate course in Blood Banking Technology and Basic Haematology for medical officers: (February 1 to March 15, 1981).

(2) Training course in Blood Banking Methodology for technicians: (May 12-26, 1981).

Mental Health:

At Bangalore, Chandigarh and Delhi:

Training course on Extension of Mental Health Services in the Community: (July, 18 - August 29, 1981).

Occupational Health:

At the National Institute of Occupational Health, Ahmedabad:

NIOH/WHO Training Course on Air Pollution and Health: (December 1-10, 1981).

Oncology:

At the Cancer Research Institute, Tata Memorial Centre, Bombay:

Training course on Carcinogenicity, Mutagenicity and Teratogenicity: (December, 1981).

Clinical Pharmacology:

*At the Department of Pharmacology, Seth G.S. Medical College, Bombay.

Biostatistics:

At the Institute for Research in Medical Statistics, New Delhi:

(1) Certificate course in Planning and Evaluation of Health Programmes: (April, 1981).

(2) Diploma course in Biostatistics: (September, 1981).

(3) Certificate course in Orientation to Biostatistics: (September, 1981).

(4) Certificate course in Statistical Techniques in Medical Research: (January, 1982).

Laboratory Animal Technology:

At the National Institute of Nutrition, Hyderabad:

(1) Laboratory Animal Supervisors Training Course: (January 2 to March 31, 1981).

(2) Laboratory Animal Technicians Training Course: (August 1 to September 30, 1981).

COURSES FOR TALENT SEARCH SCHEME FELLOWS

Cell-Biology and Cyto-Genetics:

At the Indian Institute of Science, Bangalore: (March, 1981).

Use of Radioisotopes in Medicine:

At the National Institute of Nutrition, Hyderabad: (July, 1981).

Immunological Techniques:

At the Central Jalma Institute for Leprosy, Agra: (November, 1981).

Haematological Techniques:

*At the Department of Pathology, Christian Medical College, Vellore.

Clinical Endocrinology:

*At the Institute for Research in Reproduction, Bombay.

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*Dates to be announced later.

SOME ICMR PUBLICATIONS

	Price Rs.
Menus for Low-Cost Balanced Diets and School Lunch Programmes suitable for South India (1959), Third Edition 1977, Reprinted 1978	1.50
Menus for Low-Cost Balanced Diets and School Lunch Programmes suitable for North India (1959), Second Edition 1977	1.50
Nutrition for Mother and Child (1962), Third Edition 1978	4.50
Some Common Indian Recipes and Their Nutritive Value (1964), Fourth Edition 1977, Reprinted 1980	6.50
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Dietary Allowances for Indians (1971), Reprinted 1980	5.50
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Research in Malaria - An Outline (1977)	Gratis
Health Hazards of Mycotoxins in India (1978)	5.00
Japanese Encephalitis in India, Revised Edition 1980	5.00
Recommended Dietary Intakes for Indians (1981)	4.00

These publications are available on prepayment of cost by cheque or postal order (postal charges will be extra) drawn in favour of the Director-General, Indian Council of Medical Research, New Delhi. Money orders are not acceptable. All correspondence in this regard should be addressed to the Chief, Division of Publication and Information, Indian Council of Medical Research, Post Box 4508, Ansari Nagar, New Delhi-110029.

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C.F.T.R.I., MYSORE

ACUTE HAEMORRHAGIC CONJUNCTIVITIS

Acute haemorrhagic conjunctivitis (AHC), a relatively new disease, has been known to afflict man during the past decade. The disease was first recognised in 1969 by Chatterjee and colleagues[1] in Ghana, West Africa. Since then, the disease has been reported from various parts of the globe. Although the exact figures are difficult to compute, based on the experience of the 1981 epidemic in India, the total number of affected persons in the last decade would appear to be over 100 million. Initially the disease was confined to Africa, but later it rapidly spread to the Indian sub-continent and then to Japan in 1971. Europe has also been affected, although the number of persons afflicted appears to be small[2,3]. In Australia,only a few cases have been reported so far. The first case seen in America[4] was a South Vietnamese refugee during 1980. Recently, there have been reports of epidemics of this disease in South America particularly its northern parts.

It has been noted that the conjunctivitis appears suddenly, affecting both the eyes. It can be differentiated clinically from other types of conjunctivitis, as it usually occurs in epidemic proportions and is mostly accompanied by sub-conjunctival haemorrhage of varying degrees.

During the 1971 pandemic of AHC, observations made by Kono and colleagues in Japan[5] and Wadia *et al*[6,7] from India indicated that the disease was caused by a polio-like virus. Kono and others[5] isolated an enterovirus named EV 70, from the conjunctiva of Japanese patients. Wadia and associates from Bombay reported an acute neurological syndrome with lancinating root pains down the legs, proximal flaccid weakness of the lower limbs, areflexia *etc.* (lumbosacral radiculomyelitis) in 19 patients during the same epidemic. Similar cases were also reported by Barucha and Mondkar[8] from Bombay during the same period.

On the basis of the neurological lesions reported from India, Kono *et al*[9] looked for and demonstrated the neurovirulence of the new virus in monkeys by producing hind limb paralysis after injection of virus-containing culture material into the spinal cord.

Considerable efforts were made in India to isolate the virus from the conjunctival swabs and cerebrospinal fluid of patients from Bombay but no virus could be isolated. Wadia, in collaboration with Kono and his Group in Japan[10] demonstrated in the serum of patients significant titres (> 1:16) of neutralising antibody against the EV 70 Japanese strain of the virus.

Similar neurological cases have been reported from Thailand, Taiwan and Senegal[11-13]. No major epidemic of conjunctivitis was reported between 1971 and 1980. Only sporadic cases occurred during this period with some localised outbreaks.

Division of Publication & Information, ICMR, New Delhi-110 029

In view of the widespread epidemic of acute conjunctivitis covering almost the whole country in recent months, the Indian Council of Medical Research (ICMR) constituted a Study Group of Experts to assess the problem and suggest ways and means for its investigation and control. Although exact figures on incidence of conjunctivitis from different parts of the country are not available, it appears that almost all parts of the country are affected. Cases of acute haemorrhagic conjunctivitis were seen from January 1981 onwards in southern India. The disease took an epidemic form in May 1981 in Bombay and subsequently spread to the whole of Maharashtra and Gujarat States and then to the northern parts of India in July-August, 1981.

Epidemiological features:

Not many epidemiological studies seem to have been carried out on the epidemic but some significant observations have been made in studies carried out in six villages of Mehrauli block of Delhi (Chuttani, C.S. - unpublished data). House-to-house surveys conducted during the epidemic in these villages have shown that approximately 24 per cent of the population had been afflicted with acute conjunctivitis during the epidemic period of July and August, 1981. The disease occurred in both sexes and in all age groups including children below 5 years of age. The disease had a short incubation period of 10-24 hr. and the mean duration of illness was 5-6 days in the majority of patients. Results of viral studies on conjunctival swabs and paired sera from patients in and around Delhi are awaited from the All India Institute of Medical Sciences, New Delhi.

Neurological cases:

A neurological condition similar to that reported in 1971 has been reported from different parts of India during the 1981 epidemic. Wadia, Katrak and Misra from Bombay have reported 60 cases with neurological manifestations (unpublished data). Two forms of the disease were observed by them *viz.* the spinal form and the cranial form. In the spinal form of the disease, patients experienced severe pain in the back and legs a few hours or days after initial malaise. The pain was either muscular or of a root distribution and travelled down the legs. This was followed by a sudden dramatic buckling at the knees and hips, and the patient found himself unable to get up from the floor. The paralysis varied in severity, usually affecting the proximal parts of both the lower limbs, asymmetrically. In the cranial form, notable finding was a sudden unilateral lower motor neuron type of facial palsy, often misdiagnosed as Bell's palsy. Nineteen such cases were seen during the recent epidemic.

Involvement of other cranial nerves, specially the 3rd, 5th, 6th, 9th and 10th nerves has been reported. The lesions were essentially of the lower motor neuron type. In the early phase of the disease, pyramidal signs, bladder paralysis, patchy sensory loss in the lower limbs and vertigo have been observed. One patient in this series had permanent spastic paraplegia.

Another important observation was that the neurological illness could occur in patients who had not had conjunctivitis but had been in close contact with patients of acute conjunctivitis. Neurological manifestations were more common in adult males in the age group 20-50 years. The interval between the acute conjunctivitis and the neurological symptoms varied from a few hours to 8 weeks.

The cerebrospinal fluid in these patients showed increased proteins and cells during the acute phase of the disease but as the disease subsided the cells disappeared while the proteins remained high for sometime, thereby giving a false impression of albumino-cytological dissociation. Extensive EMG studies have shown a classical pattern of denervation as seen in anterior horn cell disease with normal conduction and velocity.

Viral studies:

Attempts have been made in several laboratories in India specially at the ICMR's National Institute of Virology at Pune and the two Centres for Advanced Research in Virology at Bombay and Vellore respectively, to isolate the agent from the conjunctival swabs taken during the recent epidemic of 1981. Neutralising antibodies have also been estimated on paired sera. The following observations have been made by these laboratories:- (i) There is no evidence that the disease is due to the poliomyelitis virus; (ii) this disease does not appear to be due to cox-

Telegram: 'SCIENTIFIC' Phone: 660707

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Kindly return the following duly signed by you if you wish to continue to receive the ICMR's Research Information Bulletin. The next issue of the Bulletin will be mailed to you only after the receipt of the attached form.

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sackie A-24 virus because there is no rise of neutralising antibodies in single or paired sera; and (iii) the centre at Vellore reported significantly high antibody titres against the EV 70 virus in sera of cases with conjunctivitis. It is important to mention that in 1975 the EV 70 virus was isolated from patients of conjunctivitis during a short epidemic in Vellore.

These studies in India have been supported by Kono[14] of Japan,who has shown that- (i) Normal control sera did not reveal a rise of titres to EV 70 (ii) AHC patients showed significant rise of antibody titre in single and paired sera; (iii) significantly high titres have been found in patients who had a neurologic illness without conjunctivitis, but were close contacts of patients with conjunctivitis; (iv) antibody titres were high both in the cranial and spinal forms of the disease; and (v) antibody titres as high as 1 in 64 against EV 70 have been found in the CSF of 8 patients with the neurological disease suggesting that the virus has invaded the nervous system.

RECOMMENDATIONS:

The ICMR Study Group on AHC which met on October 17, 1981, reviewed the studies carried out so far and made the following recommendations:

1. Attempts should be made to estimate the impact of acute conjunctivitis during the recent epidemic by retrospective epidemiological studies. Retrospective data on the occurrence of this disease may be collected by the coordinator of the National Programme for Prevention of Blindness, by circulating predesigned proformae to regional institutes, upgraded medical colleges and mobile units.

2. Retrospective follow up study of the villages surveyed in the Mehrauli block of Delhi should be continued by the Investigators from Delhi for further epidemiological,clinical and serological investigations. In order to widen the scope of the study and to collect similar information from another region, a twin study in Delhi and Vellore is recommended. Serological investigations for both the studies will be carried out at Vellore. A protocol for these studies is to be submitted to the ICMR at the earliest. The possibility of including a third centre from Bombay may be kept in mind.

3. A Registry of neurological cases following conjunctivitis could be compiled under the aegis of the ICMR, the Principal Consultant for organising this Registry being located in Bombay. If the cases have to be further diagnosed serologically, the three ICMR virology laboratories can also collaborate.

4. Virological and serological studies should be taken up by the various ICMR laboratories. Biological material already available should be processed for isolation of the virus and serological examinations. Retrospective study of the material already available with the ICMR laboratories should be completed and made available to other laboratories concerned.

5. **Continued surveillance of virus:** A surveillance team which is already operating through the National Programme for Prevention of Blindness should keep a watch on cases of conjunctivitis and random samples for serological study should be sent from different regional centres to the ICMR virus laboratories. The R.P. Centre for Ophthalmic Sciences, New Delhi, will coordinate this work. This surveillance will be done for two years to begin with and could be continued in the National Programme later, if the need arises.

6. The ICMR will obtain from the WHO a bibliography on AHC compiled during the last few years.

7. Health education material on AHC will be prepared by the R.P. Centre for Ophthalmic Sciences, New Delhi, in collaboration with Central Health Education Bureau, New Delhi.

8. Studies on the status of antibodies in patients of conjunctivitis and the possible development of a vaccine will also be undertaken.

9. Research on newer drugs for prevention and cure of AHC will be encouraged.

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14. Kono, R., Miyamura, K., Ogino, T., Wadia, N.H., Wadia, P.N., Katrak, S.M. and Misra, V.P. Antibody titres to enterovirus type 70 in the 1981 Indian epidemic of acute haemorrhagic conjunctivitis. *Lancet ii:* 924, 1981.

ABSTRACTS

Some Research Projects completed recently

Prevalence and distribution of dysplasia and carcinoma of uterine cervix in young married women below 35 years in a rural population

A study was conducted on 5512 married young women from 13 villages and patients attending the hospital Out Patient Department, in order to find out the prevalence and biological behaviour of dysplasia and carcinoma of the uterine cervix. Of these women 5004 were below the age of 35 years and 508 above 35 years. Cytological analysis of the smears revealed that the incidence of dysplasia was 1.14 per cent and that of carcinoma, 0.25 per cent. The role of age, religion, age at menarche, age at marriage, marital status, education, socio-economic status, hygienic condition, parity, family planning, clinical condition of cervix and type of vaginal discharge was correlated with displastic lesions. Significant association was observed between dysplasia and advancing age, multiparity, cervical erosion, cervicitis and mucoid discharge. Of the different types of micro-organisms isolated, none showed any relation with cervical epithelial abnormalities.

The biological behaviour of various grades of dysplasia was studied. Of the 63 cases of dysplasia detected, 52 were mild, 8 moderate and 3 of severe type. Follow up in 26 cases (41.26 per cent) over a period of 4 months to 2½ years, showed that 16 (51.53 per cent) regressed to normal, 8 cases (30.76 per cent) were stationary, while 2 cases (8 per cent) progressed to severe grade.

G.S. Gahlot
Mahatma Gandhi Institute
of Medical Sciences
Sevagram, Wardha.

Immunological studies in syphilis

In vitro tests for cell mediated immunity *viz.*, lymphocyte transformation, cell migration inhibition and spontaneous rosette formation of T-lymphocytes were used to assess the cellular immune capability of syphilitic and non-syphilitic patients. The mitogen non-specifically induced a large number of cells to enlarge, proliferate and undergo DNA synthesis whereas a smaller group of cells experienced similar changes in specific response to the antigen. The degree of blastogenesis was measured by microscopic examination of blast cells in 435 patients and more accurately by incorporating radioactive thymidine into newly synthesised DNA in 78 patients. The rate of DNA synthesis was determined by scintillation counting which gave quantiatative assessment of lymphocyte response. Evidence is available from this study that *in vitro* lymphocyte reactivity to treponemal antigen is suppressed during early stages of syphilis leading to immunosuppression in patients. In the late stage of the disease cellular immunity appears to exist as increased T cell reactivity. Results of 27 cases studied, showed that lymphocyte migration was inhibited in late syphilis while early syphilis, non-syphilis venereals and normals did not show inhibition.

Another aspect of the study was an attempt to prepare a vaccine for syphilis. The spirochetes cooled in liquid nitrogen were attenuated by gamma irradiation. After a number of experiments using doses varying from 650,000 rads to 1300,000 rads, an effective dosage was found to be 1300,000 rads. The treponemes retained their motility. Virulent treponemes exposed to gamma rays at a dosage of 1300,000 rads at liquid nitrogen temperature (-196° C) formed the vaccine. Rabbits were immunised with the vaccine with 12 injections at intervals over a month, given rest and challenged intradermally. None showed symptomatic signs of infection even after 60 days of observation. Asymptomatic infection was ruled out by lymphnode transfer experiments. These results demonstrated that protection of rabbits against syphilitic infection can be accomplished by multiple intravenous injections with freshly isolated treponemes attenuated by gamma irradiation at liquid nitrogen temperature.

C.N. Sowmini
Institute of Venereology
Madras Medical College
Madras.

Publication:

Yogeswari, L. and Satyakumar, C. Successful attenuation of *Treponema pallidum*. *Indian J Sex Transm Dis 1:* 49, 1980.

SUMMARY OF THE KSHANIKA AWARD (1980) ORATION

Dr. K. Prema, Assistant Director, National Institute of Nutrition, Hyderabad, delivered the Kshanika Award (1980) Oration on Evaluation of Fertility Regulating Methods at the Indian Council of Medical Research, New Delhi, on October 29, 1981.

Rapid population growth and limited resources are generally regarded as the current major global problem and fertility regulation is a vital method for solving it. Careful evaluation of the short and long term consequences of fertility regulating methods is essential, in view of the fact that healthy individuals will be using these methods for long periods. Results of some of the investigations on the safety, efficacy and side effects of oral and injectable contraceptives, IUD and tubal sterilisation carried out in the ICMR Contraceptive Testing Unit at Madurai and the National Institute of Nutrition, Hyderabad, are summarised.

Data from the studies on oral contaraceptives (OC) indicate that use effectivity and continuation rate of combination type of OC is poor among women from low income groups. Pharmacokinetic studies suggest that plasma steroid levels are lower in undernourished women but the levels are sufficient enough to inhibit ovulation. Metabolic side effects of combination pill in undernourished women appear to be essentially similar to those reported from developed countries. Available limited data suggest that use of OCs containing 50 μg or less of ethinyl estradiol after six months of lactation did not have any adverse effect on duration of lactation or infant growth.

Phase II studies on low dose injectables showed that Net en-20 mg monthly is an effective contraceptive. Mechanism of action is similar to that of low dose progestational pill. Menstrual side effects occurred in about a fifth of women. Use of Net en-20 is associated with fewer metabolic side effects than combination pills. Net en-20 did not have any adverse effect on established lactation. Studies are underway to investigate excretion of steroids in breast milk.

Studies on Cu IUDs showed that they are safe and effective contraceptives. CuT- 200 retains its contraceptive efficacy for periods upto four years. Use of IUD is not associated with any fall in haemoglobin levels. Long term use of Cu IUD is not associated with any alteration in serum Cu levels. Long term use of Lippes loop for periods upto seven years was not associated with any adverse side effect.

Long term follow up studies on tubal ligation indicated that failure rate is as high as 1 per cent. Available data suggest that tubal ligation is not associated with any alteration in body weight or haemoglobin status. There is as yet no definite information whether tubal ligation is associated with increased incidence of menstrual abnormalities.

It is obvious that none of the currently available contraceptives are ideal, 100 per cent effective and free of side effects. But by a careful choice between OC, injectable contraceptive, IUD and tubal ligation based on the social, economic, obstetric and health profile of the women it may still be possible to provide satisfactory contraceptive coverage until more effective methods become available.

Advisory Committee/Expert Group Meetings

The following Scientific Advisory Committees of Institutes/Centres of the Council met during the month:-

Malaria Research Centre, Delhi.	November 23, 1981
Institute for Research in Medical Statistics, New Delhi.	November 24, 1981
Institute of Pathology, New Delhi.	November 25, 1981
National Institute of Cholera & Enteric Diseases, Calcutta.	November 27, 1981

The following ICMR Task Forces/Expert Groups met during the month:-

Task Force on Eales Disease	November 4-5, 1981
Task Force on Breast Feeding Practices	November 4-5, 1981
Expert Group on Bio-safety in Laboratory Work	November 9-10, 1981
Task Force on Delivery of Comprehensive Maternal and Child Health Services	November 20-21, 1981
Advisory Group on Health Services Research	November 26, 1981

*** *** ***

Dr. S.P. Tripathy, Director, Tuberculosis Research Centre, Madras, participated in the Seventh Asian Pacific Congress on Diseases of the Chest held at Hong Kong from November 1-5, 1981.

Dr. V. Ramalingaswami, Director-General,ICMR, participated in a WHO sponsored meeting of the Directors of Medical Research Councils or analoguous bodies and concerned research foci in relevant ministries of the South East Asia region held at Rangoon, Burma, between November 2-5, 1981.

Dr. Usha K. Luthra, Senior Deputy Director-General, ICMR, participated in a meeting on Childhood Disability - Family and Community Roles held at New Delhi, between November 2-5, 1981.

Dr. V. Ramalingaswami participated in a seminar sponsored by the British Government on the Prevention of Disablement held at Leeds Castle, U.K. between November 8-15, 1981.

Dr. V. Ramalingaswami as a member of the Indian Delegation, visited China between November 23-30, 1981.

Dr. G.V. Satyavati, Deputy Director-General, ICMR, participated in a meeting of Directors of WHO Collaborating Centres for Traditional and Indigenous Systems of Medicine at Geneva, between November 23-27, 1981. She presented a background paper on Traditional Medical Practices of Global Importance.

ICMR AWARDS

The Indian Council of Medical Research has awarded the following prizes to scientists for outstanding research work in various fields of biomedical sciences:

Basanti Devi Amir Chand Prize, 1982

Dr. D.K. Dastur,
Professor of Neuropathology,
Grant Medical College,
Bombay.

Neuropathology of leprosy and tuberculosis.

Dr. P.N. Raju Oration Award, 1981

Dr. P.K. Rajagopalan
Director,
Vector Control Research Centre,
Pondicherry.

Vector ecology and control.

Dr. Y.S. Narayana Rao Oration Award, 1981

Dr. K.B. Sharma,
Dean,
Maulana Azad Medical College,
New Delhi.

Studies on salmonella and streptococcal infections.

Sandoz Oration Award, 1981

Dr. P.B. Desai,
Director,
Tata Memorial Centre,
Bombay.

Cancer therapy.

Jalma Trust Fund Oration Awards, 1981

Therapy of leprosy.

Dr. G. Ramu,
Deputy Director,
Central Jalma Institute for Leprosy,
Agra.

Immunology of leprosy.

Dr. Indira Nath,
Assistant Professor of Pathology,
All India Institute of Medical Sciences,
New Delhi.

Dr. Kamala Menon Medical Research Award, 1981

Nutritional problems of children.

Dr. Vinodini Reddy,
Deputy Director,
National Institute of Nutrition,
Hyderabad.

Dr. M.K. Seshadri Prize, 1981

Community mental health.

Dr. N.N. Wig,
Professor of Psychiatry,
All India Institute of Medical Sciences,
New Delhi.

Dr. M.N. Sen Oration Award, 1981

Neurology of diabetes and stroke.

Dr. J.S. Chopra,
Professor of Neurology,
Postgraduate Institute of Medical Education
and Research,
Chandigarh.

Chaturvedi Kalawati Jagmohan Das Memorial Award, 1981

Studies on cerebrovascular diseases.

Dr. P.M. Dalal,
Chief of Neurology and Neurosciences,
T.N. Medical College,
Bombay.

Kshanika Oration Award, 1981

Leprosy - Clinico-pathological studies.

Dr. Surender Kaur,
Associate Professor of Dermatology,
Postgraduate Institute of Medical Education
and Research,
Chandigarh.

Dr. V.N. Patwardhan Prize, 1981

Dr. Ramesh V. Bhatt, Senior Research Officer, National Institute of Nutrition, Hyderabad.	Nutritional toxicology.

Dr. J.B. Srivastav Award, 1981

Dr. B. Lalitha Rao, National Institute of Virology, Pune.	Studies on influenza.

Shakuntala Amir Chand Prizes, 1981

Dr. Nirmal Kumar Ganguli, Associate Professor of Parasitology, Postgraduate Institute of Medical Education and Research, Chandigarh.	Immunology of parasitic diseases.
Dr. S. Vijayalaxmi, Junior Research Fellow, Institute for Research in Reproduction, Bombay.	Studies on inhibin.
Dr. Rakesh Tandon, Assistant Professor of Medicine, All India Institute of Medical Sciences, New Delhi.	Pathogenesis of gallstones
Dr. R.K. Naz, Research Officer, Department of Biochemistry, All India Institute of Medical Sciences, New Delhi.	Immunology of male fertility.

PROGRAMME OF SCIENTIFIC LECTURES AT THE INDIAN COUNCIL OF MEDICAL RESEARCH, NEW DELHI

Date	Topic	Speaker
17.12.1981	Source and Development of Chinese Acupuncture	Dr. Yan Run-ming, Peking.
24.12.1981	High Altitude Physiology (Shakuntala Amir Chand Prize, 1980)	Dr. S.C. Manchanda, New Delhi.

ICMR AIDED SYMPOSIA/SEMINARS/WORKSHOPS/CONFERENCES

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
Seminar-cum-Workshop in Surgery for Postgraduates and Surgeons.	October 31 - November 1, 1981	All India Institute of Medical Sciences, New Delhi.
Second Workshop on *In vitro* Cultivation of Erythrocytic Forms of *P. falciparum* and Preparation of Antigens for Serology of Malaria.	November 2-15, 1981	Department of Microbiology, St. John's Medical College. Bangalore.
Conference on Industrial and Environmental Toxicology.	November 6-7, 1981	Industrial Toxicology Research Centre, Lucknow (Society of Toxicology, India).
Symposium on the Heart.	November 6-8, 1981	Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum (Indian Academy of Sciences).
Seminar on Scientific Method in Morphosciences.	November 16-21, 1981	Maulana Azad Medical College, New Delhi (Delhi Association of Morphological Sciences).
Satellite Congress on Diabetes in the Young.	November 21-22, 1981	Ootacamund (The Coimbatore Branch of the Diabetes Association of India).
Symposium on Tropical Immunology.	November 23, 1981	Cancer Research Institute, Tata Memorial Centre, Bombay (Indian Immunology Society).
International Symposium on Early Diagnosis and Prevention of Disability.	November 26-28, 1981	Department of Pediatrics, B.J. Medical College, Pune (Indian Society of Human Genetics).
International Symposium on Incidence of Infections and Chronic Diseases - Geographical Perspectives.	December 1-4, 1981	Department of Geography, University of Madras, Madras.
National Seminar on Health for All - A National Dialogue on Operational Aspects of Comprehensive Primary Health Care and Rural Development.	December 12-13, 1981	Birla Institute of Medical Research, Gwalior.
International Symposium on Theory of Living State.	December 13-19, 1981	Department of Biophysics, All India Institute of Medical Sciences, New Delhi.
International Conference on the Applications of Mossbauer Effect.	December 14-18, 1981	Jaipur (Indian National Science Academy).

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
Workshop on Essential Streptococcus Bacteriology and Serology for Community Control of Rheumatic Fever/ Rheumatic Heart Disease.	December 17-23, 1981	Department of Microbiology, ICMR-WHO Streptococcal Diseases Reference Laboratory, Lady Hardinge Medical College, New Delhi.
Symposia on Nutrition & Environment and Current Concepts in Membrane Biochemistry.	December 21-24, 1981	Department of Biochemistry, University Colleges of Sciences, Calcutta.
30th Annual Conference on the Anatomical Society of India.	December 28-30, 1981	Medical College, Trivandrum.
Seminar on Social Aspects of Health and Medical Services.	December, 1981/ January 1982	University of Jodhpur, Jodhpur.
International Workshop on Nutrition and the Development of the Child.	January 8-15, 1982	Department of Biochemistry, M.S. University, Baroda.
Workshop on Evaluation of Mutagenic Potential of Environmental Agents: Microbial and Mammalian Systems.	February 15-19, 1982	Division of Biochemistry and Food Technology, Bhabha Atomic Research Centre, Bombay (Environment Mutagen Society of India).
Symposium on Vectors and Vector-Borne Diseases.	February 26-28, 1982	Department of Zoology, University of Kerala, Trivandrum.
International Symposium on Occupational Health Problems in Developing Countries.	February, 1982	National Institute of Occupational Health, Ahmedabad.
Symposium on Internal Auditory Canal Surgery.	March 15-17, 1982	Department of Otolaryngology, All India Instiatute of Medical Sciences, New Delhi (Neuro-otological and Equilibriometric Society of India).

COUNCIL'S TRAINING PROGRAMMES FOR 1981

Leprosy:

At the Central Jalma Institute for Leprosy, Agra:

Training course in Leprosy for medical officers: (February 15 to March 28, 1981, and August 31 to October 14, 1981).

Virology:

At the National Institute of Virology, Pune:

(1) Diploma course in Medical Virology of Poona University: (July, 1981).

(2) *Workshop on Japanese Encephalitis in India.

Endocrinology:

At the National Institute of Nutrition, Hyderabad:

Annual certificate course in Endocrinological Techniques and their Application: (August to September, 1981).

Nutrition:

At the National Institute of Nutrition, Hyderabad:

(1) Annual certificate course in Human Nutrition for teachers from Agricultural Universities: (June/July, 1981).

(2) M.Sc. (Applied Nutrition) course: (June 1, 1981 to February 28, 1982).

(3) Annual certificate course in Public Health Nutrition: (October/November, 1981).

(4) Annual certificate course in Nutrition: (December 1, 1981 to February 28, 1982).

Haematology:

At the Blood Group Reference Centre, Bombay:

(1) A certificate course in Blood Banking Technology and Basic Haematology for medical officers: (February 1 to March 15, 1981).

(2) Training course in Blood Banking Methodology for technicians: (May 12-26, 1981).

Mental Health:

At Bangalore, Chandigarh and Delhi:

Training course on Extension of Mental Health Services in the Community: (July 18 - August 29, 1981).

Occupational Health:

At the National Institute of Occupational Health, Ahmedabad:

NIOH/WHO Training Course on Air Pollution and Health: (December 1-10, 1981).

Oncology:

At the Cancer Research Institute, Tata Memorial Centre, Bombay:

Training course on Carcinogenicity, Mutagenicity and Teratogenicity: (December, 1981).

Clinical Pharmacology:

*At the Department of Pharmacology, Seth G.S. Medical College, Bombay.

Biostatistics:

At the Institute for Research in Medical Statistics, New Delhi:

(1) Certificate course in Planning and Evaluation of Health Programmes: (April, 1981).

(2) Diploma course in Biostatistics: (September, 1981).

(3) Certificate course in Orientation to Biostatistics: (September, 1981).

(4) Certificate course in Statistical Techniques in Medical Research: (January, 1982).

Laboratory Animal Technology:

At the National Institute of Nutrition, Hyderabad:

(1) Laboratory Animal Supervisors Training Course: (January 2 to March 31, 1981).

(2) Laboratory Animal Technicians Training Course: (August 1 to September 30, 1981).

COURSES FOR TALENT SEARCH SCHEME FELLOWS

Cell-Biology and Cyto-Genetics:

At the Indian Institute of Science, Bangalore: (March, 1981).

Use of Radioisotopes in Medicine:

At the National Institute of Nutrition, Hyderabad: (July, 1981).

Immunological Techniques:

At the Central Jalma Institute for Leprosy, Agra: (November, 1981).

Haematological Techniques:

*At the Department of Pathology, Christian Medical College, Vellore.

Clinical Endocrinology:

*At the Institute for Research in Reproduction, Bombay

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*Dates to be announced later.

SOME ICMR PUBLICATIONS

	Price Rs.
Menus for Low-Cost Balanced Diets and School Lunch Programmes suitable for South India (1959), Third Edition 1977, Reprinted 1978	1.50
Menus for Low-Cost Balanced Diets and School Lunch Progarammes suitable for North India (1959), Second Edition 1977	1.50
Nutrition for Mother and Child (1962), Third Edition 1978	3.50
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Medicinal Plants of India, Vol. I (1976)	30.00
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These publications are available on prepayment of cost by cheque or postal order (bank and postal charges will be extra) drawn in favour of the Director-General, Indian Council of Medical Research, New Delhi. Money orders are not acceptable. All correspondence in this regard should be addressed to the Chief, Division of Publication and Information, Indian Council of Medical Research, Post Box 4508, Ansari Nagar, New Delhi-110029.

ANNOUNCEMENT

International Symposium on Chemotherapy and Management of Tuberculosis at the Tuberculosis Research Centre, Madras (Silver Jubilee Year)

The Tuberculosis Research Centre (formerly the Tuberculosis Chemotherapy Centre), Madras, is celebrating its Silver Jubilee this year. To commemorate this occasion, the Centre is organising an International Symposium on "Chemotherapy and Management of Tuberculosis" at Madras on 16th and 17th December, 1981. The topics that are likely to be included are **Conventional and Short-course Chemotherapy of Tuberculosis, Extrapulmonary Tuberculosis, Operational Research and National Tuberculosis Programme, and Laboratory Studies in Tuberculosis.** The symposium will consist of lectures by distinguished invited speakers and of free communications of 10 minutes duration. Further details can be had from Dr. R. Parthasarathy, Assistant Director, Tuberculosis Research Centre, Chetput, Madras-600 031.

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C.F.T.R.I.

EVALUATION OF FERTILITY REGULATING METHODS IN WOMEN

Rapidly expanding population and limited resources are thought to be the most pressing global problems today. Fertility regulation has, therefore, become the major concern of people of all walks of life. The second half of the twentieth century which witnessed the most massive increase in population in the history of mankind also witnessed the discovery and widespread use of dependable effective contraceptive methods. Prolonged use of contraceptive methods by practically every human being is an essential prerequisite for the control of expanding population. This means that for the first time enormous numbers of healthy men and women will be exposed to contraceptive agents for long periods of time. It is, therefore, essential that the efficacy and safety of contraceptive methods be evaluated with care. Exhaustive studies on safety and efficacy including effect on progeny in experimental animals, at least one of which is a subhuman primate, precede any studies on human volunteers. Preliminary studies in limited number of volunteers for safety and efficacy form the first two phases of evaluation of contraceptives in human beings. These are followed by studies on acceptability, use effectiveness, clinical and metabolic side effects. If these are satisfactory, contraceptives are released for clinical use, however, epidemiological studies on short and long-term sequelae, return of fertility and possible effects on progeny either because of accidental conception due to method failure or ingestion of contraceptives excreted in breast milk, continue over several years to keep track of possible long-term consequences of contraceptive usage.

A summary of the work done in the contraceptive testing units of the Indian Council of Medical Research (ICMR) especially the one situated in Madurai and the National Institute of Nutrition, Hyderabad, during the last decade with respect to evaluation of low dosage combination pill, low dosage injectable, intrauterine devices (IUDs) like Lippe's loop and copper T device, and tubectomy is given in the next few pages.

Oral contraceptives:

Until about five years ago oral contraceptives (OCs) were the most widely used contraceptive method in developed countries. It was estimated that over 50 million women were using the combination pill[1]. Ease of medication and freedom from immediate side effects were the major factors responsible for the popularity of the pill. Prospective studies during the last ten years have shown that use of OCs especially in women beyond 35 years, who smoke and tend to use the pill for longer than five years, is associated with some health hazards[2] and this has led to a fall in the number of OC users in developed countries.

In India, clinical trials conducted in the ICMR net-work of contraceptive testing units during the

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early seventies showed that the acceptance of the pill was low among the poorer segments of population. Even among those who accepted the pill hardly 20-30 per cent continued to use the pill at the end of one year. OCs were introduced in the National Family Planning Programme four years ago. The national figures indicate that there are no more than 85,000 pill users in the entire country and very few continue using it for any length of time. There is an urgent need to assess the socio-cultural factors that come in the way of wider acceptance and better continuation of this easy to use contraceptive. The help of social scientists might be sought to design appropriate remedial measures and to evaluate effective methods of mass communication to overcome this problem.

Another even more worrying aspect of pill use has been the very poor patient compliance. Studies conducted by the National Institute of Nutrition (NIN), Hyderabad, showed that only about 25 per cent of women took the tablets without missing even one pill. The rest miss one or more pills at times even up to 5-6 pills during a cycle. Studies on steroid levels in these women confirm the fact that they often miss the pill and even when they have not missed it, they tend to take it at times other than those advised, so that the steady state of administered steroid is really no more than an unsteady wobble. These finding have since been confirmed in different studies and a recent multicentric WHO study showed that Indian pill users have the lowest compliance rate. As expected the accidental pregnancy rate is higher (about 5 per cent or more) in Indian OC users. Thus, in spite of the higher theoretical efficacy of the pill, use effectiveness is lower in Indian women when compared to other methods like IUDs.

Studies on poor patient compliance brought to light some interesting aspects. It is assumed that whenever two or more pills are missed there is likely to be some menstrual disturbances in the form of break through bleeding (BTB). It is often suggested that calculating the prevalence of BTB from a carefully maintained menstrual chart is one of the methods for monitoring regularity of pill use. Careful scrutiny of menstrual charts of women who had missed pills and those who had not, however, failed to show any difference in prevalence of BTB between the two groups. Though 75 per cent of women had missed one or more pill at one or more cycles, the data on menstrual cycles in relation to pill use show that there were no menstrual cycle irregularities. That this is not due to under reporting is shown by the fact that menstrual abnormalities were promptly reported when the same group changed over to injectable progestogens. This entirely unexpected finding of good cycle control in spite of poor patient compliance in tablet taking raises several interesting questions regarding the relationship between circulating steroid level, both endo- and exogenous, endometrial changes and occurrence of BTB in pill users. Some of these aspects are currently being investigated.

Most of the epidemiological data on health hazards associated with OC use are derived from information obtained from OC users in developed countries[1-3]. There are well known ethnic differences, differences in dietary intake, nutritional status, living style, health problems and availability of health care between developed and developing countries. There has been speculation that use of OCs might aggravate already existing undernutrition. Others have speculated that the risk of cardiovascular disease (CVD) might be lower in Indian women. Till now use of OCs has not been widespread enough for epidemiological investigations regarding health hazards associated with OCs in Indian women, to evaluate which of these contentions is correct. Available data from developed countries suggest that most of the health hazards in OC users are associated with metabolic changes *e.g.* CVD risk is associated with alteration in lipid profile and coagulation factors. It is, therefore, possible that investigation of metabolic side effects of OC use in Indian women might provide some clues regarding possible health hazards associated with OC use.

Studies on metabolic side effects of OCs in undernourished women undertaken in NIN indicate that use of combination pill is associated with alteration in glucose tolerance[4]. The magnitude of the change and proportion of women showing this change are similar to those reported from developed countries. About 10 per cent of women showed impaired glucose tolerance. Studies undertaken in the Institute for Research in Reproduction (IRR), Bombay, showed that a much higher proportion of OC users developed alterations in glucose tolerance (Unpublished data). There were small but significant differences in plasma glucose and triglyceride levels both before and after OC use between OC users in Bombay and

Hyderabad (Unpublished data). These data suggest that there might be regional differences in some of the metabolic side effects in OC users in different regions of the country and emphasize the need for multicentric studies with adequate quality control to investigate metabolic side effects and their health consequences in a vast country like India.

The interest in changes in the glucose tolerance test (GTT) in pill users stems mainly from the impression that this may represent an early warning of impending diabetes. Studies from the UK indicate that this fear might be unwarrented because there were no difference in occurrence of clinical diabetes between OC users and nonusers[2]. It is, therefore, possible that alterations in GTT in Indian OC users are unlikely to be associated with risk of clinical diabetes.

Available data from studies in developed countries indicate that use of OCs is associated with an elevation in plasma triglycerides and cholesterol[2]. These changes are thought to be mainly due to an increase in low density lipoprotein fraction. Data from India indicate that the triglyceride and cholesterol levels in Indian women from low income groups are lower than their Western counterparts[4]. Use of combination pill resulted in elevation of triglyceride and cholesterol levels[4]. The pre- and post-treatment triglyceride and cholesterol levels were lower in Indian women. It has been debated whether Indian OC users with lower triglyceride and cholesterol levels may have a lower cardiovascular disease risk. Available data on Indian women with CVD show that though their lipid levels were higher than normal Indian women, the levels were far below those of their Western counterparts. This might mean that it is the magnitude of change and not the actual values that determine the CVD risk. If this were so, Indian OC users may not be at a lower risk of CVD than Western women. Some of the more recent investigations from UK and USA have suggested that changes in lipoprotein fractions and coagulation factors might be the critical determinants of CVD risk. There is so far no Indian data regarding these in normal women, OC users or women suffering from CVD. Since CVD is the single major health hazard associated with OC use[2], it is essential that investigations are undertaken to obtain information in these aspects. There is a clinical impression that Asian women have lower incidence of thrombo - embolism. In India fewer women smoke, OC users are seldom beyond 35 years of age and rarely use the pill for more than 2-3 years. It has been suggested that because of these factors Indian women using OCs might be at a lower risk of developing CVD. Epidemiological studies are needed to confirm whether this speculation is correct.

Some studies from developed countries indicated that use of OCs was associated with changes suggestive of deterioration in some of the biochemical tests used for assessment of riboflavin and pyridoxine status which were corrected by B_2 and B_6 supplementation. Based on these observations it had been suggested that routine supplements of riboflavin and pyridoxine should be given to OC users especially in developing countries where B complex deficiency is very common. Others feel that the biochemical changes observed amount to no more than homeostatic alterations associated with OCs and caution that use of large dose of vitamins for prolonged periods might not be without health hazards. In addition, concern has been expressed over the fact that the cost of the pill is likely to double if routine vitamin supplements are to be administered, and the already expensive pill may then become far too expensive for widespread use among poorer segments of population. If illiterate women are asked to take two kinds of pills the already poor patient compliance in pill taking may become worse with greater number of pregnancies due to method failure. In an attempt to explore this question the ICMR undertook a multicentric collaborative study to investigate whether the prevalence of clinical signs of vitamin B complex deficiency shows any alteration in OC users. Data from the study suggest that though prevalence of clinical signs of deficiency varies from 2-15 per cent in non-pregnant women in different centres, use of OCs was not associated with any increase in prevalence of glossitis. Routine vitamin supplementation to OC users did not result in significant reduction in prevalence of glossitis[5]. Studies undertaken by the NIN, Hyderabad, and IRR, Bombay, showed that though biochemical deficiency of riboflavin and pyridoxine existed in 60-80 per cent of women, use of OCs was not associated with any deterioration in riboflavin and pyridoxine status. Nor did routine vitamin supplements have any beneficial effect[5]. Thus data from these studies suggest that there may not be any need for routine vitamin supplements in OC users and have helped in removing one of the

possible hurdles in the widespread use of OCs in the National Family Planning Programme.

Information obtained from prospective studies in the developed countries has shown that use of OCs is associated with alteration in some of the laboratory parameters used for assessment of immune function suggestive of immune depression. It has also been shown that use of OCs is associated with some increase in morbidity due to infection. Increased susceptibility to infection might constitute a more serious health problem under the existing conditions of poor environmental hygiene in which poorer segments of the Indian population live. Studies were, therefore, undertaken in NIN to investigate immune status and morbidity due to infection in OC users. Data from these studies[6] showed that the currently used low dosage combination pills do not cause any alteration in cell mediated immune status as assessed by T cell per cent, and phytohaem agglutinin induced lymphocyte transformation as measured by ^{3}H thymidine incorporation. Nor was there any alteration in humoral immune status as assessed by B cell per cent, immunoglobulin levels and total haemolytic complement activity (Table I). Studies on prevalence of morbidity due to infection showed that prevalence of common infections like gastroenteritis, respiratory infections and skin infections in OC users was similar to those seen in women from similar socio-economic groups, not using OCs. It is reassuring to note that use of low dosage OC is not associated with any immune depression or morbidity due to infection.

Table I. Immune status of women taking OCs

Group	% T Lymphocytes T/C ratio	^{3}H Thymidine incorporation	% B Lymphocytes	CH_{50} μ/dl	IgG mg/dl
Control:					
Non-pregnant, non-lactating	54.0 ± 1.87 (29)	18.2 ± 4.81 (10)	24.2 ± 2.47 (16)	67.3 ± 3.18 (12)	780 ± 79.4 (17)
Oral pill users	57.1 ± 1.53 (52)	18.8 ± 4.30 (20)	26.2 ± 2.36 (18)	56.7 ± 2.85 (12)	808 ± 52.6 (40)

Values are Mean ± S.E.

Figures in parentheses indicate number of women.

There had been conjecture whether use of OCs might be associated with liver damage especially in developing countries where hepatitis and parasitic infestations are common. Studies undertaken in NIN and elsewhere have shown that these fears are unwarrented[4]. In recent years alpha feto protein (AFP) has been used as a marker for indicating hepatic damage followed by regeneration. Estimation of AFP levels in OC users indicates that though there was a small but significant rise in AFP levels during the first few months of OC use, levels returned to normal with increasing duration of OC use[7].

The risk of neoplasia in OC users has been a widely debated issue with conflicting claims[3]. There is, however, a unanimous acceptance of the fact that use of OCs is associated with an increase in benign hepatomas[3]. These tumours are rare; reported

incidence varying from 1 in 10,000 to 1 in 100,000 in different regions. However, lack of obvious symptoms and chances of sudden, often lethal haemorrhage in such women renders this one of the most lethal neoplastic health hazards in OC users. Several complicated and expensive procedures like liver scan or hepatic angiograms have been suggested and used as screening methods for detection of this neoplasm in OC users. Most of the hepatomas secrete AFP. It is, therefore, possible that plasma AFP measurement might serve as a simple screening procedure for hepatomas in OC users.

Dosage of the majority of drugs is determined on the basis of body weight. The doses of currently used combination pills have been tailored to suit the needs of women in developed countries who weigh on an average 55-60 kg. The average weight of Indian women from the low income group is only 45 kg. Will a lower dose of progestogen and estrogen suffice for the Indian women? The question is far from academic because metabolic side effects and health hazards of OC use are related to the dosage of ingested steroids. Studies undertaken in NIN, Hyderabad, indicate that contrary to expectation for any given dose the steady state of the drug is lower in undernourished women from the low income group. This is because undernourished women excrete the drug faster[8]. However, the dosages of estrogen and progestogen in currently available low dose combination pills are still sufficient enough to inhibit ovulation and retain contraceptive efficacy.

Low dosage injectable progestational contraceptives:

Data presented so far, indicate that though OCs are safe and effective contraceptives, acceptance, use effectiveness and continuation rate for OCs are poor among poorer segments of population in India. Injections are a popular mode of medication in this segment of the population and injectable contraceptives might, therefore, be a more readily accepted method. Injectables are easier to administer and monitor at least in the urban communities.

The currently available estrogen progestogen combination injectables contain high dose of estrogens and might be associated with metabolic side effects and health hazards similar to, if not higher than the currently used OCs. Progestogens are reported to be relatively free from these health hazards. But the currently available injectable progestogens, depo medroxy progesterone acetate (DMPA) 150 mg and norethisterone acetate (NET) 200 mg contain high doses of the gestogen, cause ovulation inhibition and severe disruption of menstrual cycle and some delay in return of fertility after discontinuation of injections. If dosage of the injectable can be so reduced that it acts like the progestational minipill and not cause ovulation inhibition, menstrual and metabolic side effects might decrease and there might be prompt return of fertility. Phase II clinical trials were started in the peripheral contraceptive testing unit of ICMR at Madurai in 1972 to investigate whether this was possible. Different doses of NET and DMPA were injected once a month in volunteers. Menstrual patterns, occurrence of pregnancy, changes in target organs like endometrium, cervical mucus and vaginal cytology, plasma levels of the injected steroid and the endogenous steroid levels were used to monitor these women. Data on these parameters in women using norethisterone 0.35 mg tablets daily were used to find out whether the response to the injectable progestogen is similar to the progestational minipill. Studies were also undertaken to investigate whether addition of small doses of estrogen would result in reduction of menstrual disturbances.

Three doses of injection DMPA 10, 15 and 20 mg monthly and three doses of injection NET 10. 20 and 30 mg monthly were tested over the next two years. Injection of DMPA 10 mg or NET 10 mg monthly did not have any effect on menstrual cycle, or target organ and were ineffective as contraceptives. Injection of NET 30 mg and DMPA 20 mg monthly caused ovulation inhibition and marked alterations in menstrual cycle. Injection of 20 mg of NET monthly and DMPA 15 mg monthly were associated with far fewer menstrual side effects - similar to those seen in NET 0.35 mg pill users. Addition of small doses of estrogens to either the injected or ingested progestogen resulted in some improvement in menstrual side effects but an unacceptable fall in contraceptive efficacy. This might be attributable to the fact that added estrogens at times nullified the effect of gestogen on target organs[9]

Net 20 mg monthly prevented typical cervical mucus arborisation during midcycle. Vaginal cytology showed progestational effect even during the

midcycle. Endometrial biopsy showed considerable variation, in about 50 per cent of premenstrual biopsies, glands showed typical secretory change. Often a mixed pattern of secretory and proliferative glands lying side by side was noted. At times glands showed secretory exhaution. Stroma showed patchy areas of edema and pseudodecidual reaction even during the preovulatory phase. Changes in target organs were similar to those seen in norethisterone 0.35 mg pill users[10].

Estimation of plasma NET levels showed that following an initial peak level varying from 4-6 ng/ml, levels often fell below 1 ng/ml. In the majority of cases plasma progesterone estimations showed that progesterone levels were above 5 ng/ml in nearly two thirds of the women confirming that ovulation had occurred in the majority of women (Unpublished data).

Investigation of metabolic side effects of NET 20 mg users showed that unlike combination pill, use of NET was not associated with any alteration in glucose tolerance. Total glucose as well as area under the glucose curve remained unaltered in NET 20 users. There were no alterations in triglyceride or cholesterol levels, plasma albumin and total proteins. Mineral and vitamin nutritional status remained unaltered in NET 20 users during the first year of use[11]. Some preliminary data suggest that use of NET 20 is not associated with any alteration in laboratory parameters of immune function nor any alteration in morbidity due to infection. Phase III clinical studies undertaken in Madurai and Hyderabad confirmed the Phase II trial data that NET 20 is an effective contraceptive. Among the pregnancies reported there was one ectopic gestation. The comparatively higher incidence of ectopic gestation in progestational contraceptive users is well documented and this is most probably due to alterations in tubal motility. The comparatively greater incidence of ectopic gestation in NET users suggests that alteration in cervical mucus is unlikely to be the major mode of contraceptive action, because, if this were so, ectopic pregnancy to uterine pregnancy ratio should not get altered. Results of phase III studies confirmed the earlier data that use of NET 20 was associated with minimal menstrual disturbances. There was no progressive increase in menstrual disturbances with increasing duration of NET use. There was a prompt return of normal menstruation and fertility following withdrawal of NET 20[12].

Thus studies conducted over the last nine years have resulted in evolution of a low dosage progestational monthly injectable contraceptive which appears to be effective and safe and is associated with minimal menstrual and metabolic side effects. Monthly injectable contraceptives are easy to administer and monitor, at least in the urban set up. Preliminary phase III studies also suggest that acceptability and continuation rates for this monthly injectable are higher than those for OCs among urban poor (Table II). If wider trials with this injectable confirm these observations, the monthly injectable might form a useful addition to the contraceptive armamentarium in the developing countries efforts to contain population explosion.

Intrauterine contraceptive devices:

Hormonal contraceptives, either pill or injectable, are expensive and require sustained motivation on the part of the women for continued use. On the other hand intrauterine contraceptive devices (IUDs) are effective, safe, reversible, economical methods of contraception that requires only the decision to get the device inserted rather than sustained motivation for continued use. Because of these advantages IUDs form one of the most important methods of mass fertility control, especially among illiterate, indigent women in developing countries[13]. Ample evidence exists today to show that no single inert IUD has any definite advantage over the others. Early clinical trials have demonstrated that the second generation bioactive IUDs, especially Copper T devices (CuT) may be safe and effective alternatives to inert devices[13]. Clinical trials undertaken in the peripheral contraceptive units of ICMR during the early 70's confirmed the safety and efficacy of copper devices (CuT 200, 220, 380A and CuY)[14]. Data from these trials indicated that of these devices CuT 200 was associated with lower menstrual disturbances and also higher continuation rates. As a result of these data CuT 200 was introduced in the National Family Planning Programme and with the introduction of CuT there was some increase in the number of IUD insertions.

What is the ideal time for IUD insertion A large segment of women come under MCH care at the time

Table II. Net cumulative rates by type of termination per 100 users for 15 months of injection NET 20 mg

Type of termination	6 months	12 months	15 months
Pregnancy	1.03	2.08	2.62
Menstrual disorders	12.22	19.09	21.23
Planning pregnancy	0.52	4.76	7.97
Non-medical reasons	8.18	15.59	18.27
Continuation rate	78.05	58.48	49.91
Women months of use	1027	1802	2099
Number of women using the method at the end of the period	149	110	93
Per cent lost for follow up	5.40	6.40	6.40

Total number of acceptors 203

of delivery, and psychologically, women are thought to be most receptive to contraceptive advice during this period. Data from ICMR trials, however, indicated that women do not often accept IUD insertion during the immediate postpartum period and even among acceptors the expulsion rates were very high. Concurrent IUD insertion at the time of abortion was safe and effective and not associated with any increase in pelvic infection rates. Interval insertions were associated with slightly higher prevalence of menstrual side effects. There is thus no ideal time for IUD insertion. IUDs can be inserted as and when the woman is accessible and can be persuaded to accept the device[15]. The reassuring finding regarding safety of post-abortion insertion led to widespread use of CuT and Lippe's loop for contraception immediately after medical termination of pregnancy.

In India, more than 50 per cent of IUD insertions are done in women who have two or more children at the time of insertion, who use IUD for family limitation than spacing. Because of the preponderance of this group, it becomes essential to determine the possible long-term effects of IUD use. Studies on long-term use of Lippe's loop indicate that there was no increase in side effects, pregnancies or complications following use of Lippe's loop for periods up to seven years[16]. There appeared to be an increase in the incidences of menstrual abnormalities, intrauterine displacements[16] and endometritis[17] in women who had been wearing the same device for longer than seven years. These data suggest that Lippe's loop should preferably be removed after seven years of use[16]. Further investigations are needed to confirm this observation. It is not known whether removal of the device and immediate insertion of another one will result in reduction of these side effects. Further studies are needed to investigate these aspects because Indian women often tend to use IUDs for long periods.

At the time when CuT 200 was introduced for clinical trials in the contraceptive testing units of ICMR, it was advised that CuT 200 should be removed and replaced once in two years. The recommendation was made on the basis of the computed *in vitro* release rates which suggested that the Cu coil in CuT will no longer be releasing adequate amounts of copper beyond 24 months. Removal and reinsertion every two years will pose problems under the existing conditions in the

National Family Planning Proagramme. Studies undertaken in the contraceptive testing units of ICMR indicated that contrary to theoretical expectations, CuT 200 retained its contraceptive efficacy for periods up to 48 months[18], thus removing one of the constraints that might have come in the way of wider use of CuT 200 in the National Family Planning Programme.

A wide variety of minerals, antibiotics and hormones get absorbed from the genital tract. Concern has been expressed whether absorption of copper from CuT 200 could result in toxic sequelae in long-term CuT users. Studies undertaken at the NIN, Hyderabad, showed that use ot copper IUD for periods up to 4 years was not associated with any increase in serum copper levels or in urinary excretion of Cu[19]. It appears that the ionic copper released from CuT gets bound to proteins in the uterine fluid and so does not get absorbed. The fear of copper toxicity in long-term CuT users is, therefore, unfounded.

Perforation of uterus is one of the rare complications of IUD insertion. Ample data exist to indicate that perforation with Lippe's loop does not pose any major health hazards and the Lippe's loop could be removed as and when possible. The method of insertion of CuT device has been modified with the specific view of minimising risk of perforation. Studies undertaken in the contraceptive testing units of ICMR showed that perforations, though rare, continued to occur in CuT users also. Unlike perforation with Lippe's loop, perforation with CuT is associated with marked tendency for adhesion formation[20] and may pose some health hazard. Therefore, it is mandatory that the device should be removed as soon as perforation is diagnosed.

Tubal sterilisation:

In India, the mean age of marriage is still hovering around the mid-teens and by the time these women are in their mid-twenties they have three or more living children. They need a simple method for fertility control for the next 25 years. It is hardly surprising therefore, that tubectomy, a simple, surgical, permanent method of fertility control is widely practised in India. The widespread use of tubectomy is due to the fact that it is a one time method and being a surgical method it is deemed to afford near complete protection against pregnancy for the rest of the woman's reproductive years. However, no contraceptive method is 100 per cent effective. How often do failures in tubal sterilisation occur? An attempt was made to follow up women who had undergone tubal sterilisation in Madurai Rajaji Hospital over a 10 year period. Follow up rate in this group of women was about 85 per cent. Data showed that failure rate was higher in transvaginal tubectomy than in abdominal tubectomy. Tubectomy done at the time of caesarean section had the lowest failure rate in this series. Fifty per cent of those who became pregnant reported in the first two years after tubectomy, but in occasional cases pregnancy occurred as late as 8-9 years after tubal sterilisation. The most common cause of pregnancy was the failure to identify one or both the tubes at the time of initial surgery. Recanalisation of the tubes and attachment of the lateral end of the tube to ovary after lateral fimbriectomy were the other reasons for the failure[21]. It would, therefore, appear that if adequate care is taken at the time of surgery to identify the tube and sterilisations were done carefully using modified Pomeroy's method, the failure rate following tubal sterilisation should be very low.

Changes in body weight in contraceptive users:

There is a widespread belief among the lay public that use of OCs, tubectomy and IUD insertion are associated with marked weight gain and obesity. Some physicians argue that if this were so it should indeed be considered as a health benefit in undernourished women. Others suggest that weight gain if it occurs might be attributable to the absence of nutritional depletion due to pregnancies and lactation. There are some women who complain that since they accepted contraceptives they had been loosing weight. Prospective studies on changes in body weight in OC users, injectable contraceptive acceptors, IUD users and women who had undergone tubectomy were undertaken in NIN to investigate this problem. Data from the study showed that irrespective of the method used there were no alterations in the mean body weight of the group at any time up to a period of one year.

However, careful analyses of data in terms of gain or loss in body weight in individuals in relation to period of use of the contraceptive showed that body weight remained unaltered in only 50 per cent

of women. The others showed either weight gain or weight loss (Table III). The proportion of women showing weight gain or loss were similar so that the mean body weight of any group at any time remains unaltered. Studies on changes in body weight in women not using any contraceptives confirmed that this is an universal trend in women. The weight gain or loss which occurs even in normal population over some years is attributed to the contraceptive procedure by the contraceptive acceptor.

Table III. Changes in body weight in relation to duration of OC use (longitudinal study)

Changes in weight	Percentage of women showing changes in body weight			
	3 months	6 months	9 months	12 months
Weight gain:				
> 4 kg	6.1 (8)	11.4 (15)	9.1 (12)	6.8 (9)
2-4 kg	9.8 (13)	10.6 (14)	14.4 (19)	24.3 (32)
No alteration (*i.e.* gain or loss < 2 kg)	72.7 (96)	50.7 (67)	43.9 (58)	38.6 (51)
Weight loss:				
2-4 kg	7.6 (10)	14.4 (19)	23.5 (31)	21.2 (28)
> 4 kg	3.8 (5)	12.9 (17)	9.1 (12)	9.1 (12)
Body weight (kg)	44.2 ± 7.27	43.7 ± 7.43	44.6 ± 7.75	44.5 ± 7.32

Total number of women studied 132.

Figures in parentheses indicate number of women.

Body weight values are Mean± S.D.

Anaemia and contraceptive use:

In India anaemia is a major public health problem. Prevalence of anaemia in non-pregnant women is reported to range from 20-60 per cent. There had been suggestions that contraceptive use might aggravate this existing nutritional problem. OCs have been shown to cause alterations in biochemical indices of folate status suggestive of folate depletion. IUD use is associated with excessive blood loss during menstruation. Tubectomy is at times associated with menstrual disturbances and excessive blood loss.

Prospective and cross sectional studies on haemoglobin (Hb) status of women using various contraceptives indicate that use of any of these methods is not associated with a fall in the mean Hb

Table IV. Haemoglobin levels in IUD and hormonal contraceptive users: Cross sectional study

Group	No.	Haemoglobin g/dl	% of women with level below12 g/dl
Contraceptive advice seekers	428	12.7 ± 1.67 *	29.2
Copper IUD wearers:			
< 1 year	98	12.7 ± 1.26	30.1
1-3 years	44	12.9 ± 1.29	27.2
Lippe's loop wearers:			
1 year	75	12.5 ± 1.21	26.3
1-3 years	38	12.7 ± 1.48	23.6
3-10 years	20	12.5 ± 1.72	25.0
Oral pill users:			
12-18 months	106	12.6 ± 1.37	26.4
Injectable progestogen DMPA 150 mg/3 months for 12 months	20	12.9 ± 1.86	25.0

*Values are Mean ± S.D

levels (Table IV). It is possible that the deleterious effect of contraceptive use, even if it exists, is far lower than the deleterious effect of pregnancy and lactation on haemoglobin levels[22].

Use of contraceptives in lactating women:

The importance of lactation in infant survival and growth in poorer segments of population in developing countries is well recognised. Some of the earlier studies have indicated that use of combination pill with high doses of estrogen might have a suppressive effect on lactation. Injectable contraceptives and IUDs were reported to be free from this side effect.

Studies were undertaken in National Institute of Nutrition to investigate the effect, if any, of use of various contraceptives on lactational performance. Duration of lactation and growth of breast fed infants were used as parameters to evaluate lactational performance. Data indicate that none of the currently used contraceptives had any effect on duration of lactation (Table V). There were no differences in growth of breast fed infants of contraceptive users and women not using contraceptives[23].

These studies brought to light a curious observation regarding lactational amenorrhea. Use of any hormonal contraceptives irrespective of type, dose or mechanism of action resulted in marked shortening of duration of lactational amenorrhea, even though duration of lactation which is the most critical determinant of duration of lactational amenorrhea remained unaltered[23]. Further studies need be undertaken to investigate this phenomenon because these may not only shed some light on the effect of hormonal steroids on hypothalamus-pituitary-ovarian axis in lactating women, but also on hormonal factors

Table V. Duration of lactation and lactational amenorrhea in women using hormonal contraceptives and IUD

Group	Number	Previous lactational period		Present lactational period	
		Duration of lactation (months)	Duration of lactational amenorrhea (months)	Duration of lactation (months)	Duration of lactational amenorrhea (months)
Control	1917	19.5 ± 9.41	10.9 ± 5.02	19.8 ± 9.63	11.1 ± 5.01
Inj. DMPA 150 mg 3 monthly	22	20.5 ± 10.41	11.2 ± 5.63	22.2 ± 11.84	6.2 ± 3.21★
Inj. Net-en-20 mg monthly	51	19.9 ± 10.51	11.5 ± 5.95	19.4 ± 10.93	3.1 ± 4.13☆
Combination pill (150 μg of d-norgestrel and 50 μ g ethinyl estradiol)	52	19.4 ± 10.45	10.8 ± 5.75	20.6 ± 10.82	8.7 ± 4.10☆
Combination pill (150 μg of d-norgestrel and 30 μg ethinyl estradiol)	50	20.3 ± 11.41	11.1 ± 5.92	20.7 ± 10.95	8.8 ± 4.15
Copper IUD users	68	20.2 ± 10.83	10.6 ± 5.81	20.8 ± 10.82	10.8 ± 5.63
Tubal ligation	55	21.0 ± 11.95	11.2 ± 5.96	21.6 ± 10.67	11.6 ± 5.42

Values are Mean ± S.D.

☆ P < 0.01

★ P < 0.001

involved in return of menstruation and fertility in lactating women.

Ample data exist to indicate that steroids get excreted in breast milk. Are these products metabolically active? Do they get absorbed from the infant's gastrointestinal tract? Could there by any long-term consequences of such a steroid ingestion on the infant? So far, there is very little information on these aspects. Even if the women in India start using OCs after six months of lactation, the infant is likely to be exposed to the steroids in milk over the next 12-18 months. Studies have been undertaken to investigate this aspect by longitudinal follow up of infants who had been breast-fed while their mothers were using OCs. Available limited data do not show any alteration in physical growth performance. Surveillance of all infants over the last five years has brought to light one case of enlargement of breast in a female child at 18 months of age whose mother had started using OCs three months earlier. The woman was advised to stop breast feeding as the child was already 1½ years old. Over the next six months the enlargement of the breast regressed. Studies are being continued to investigate these aspects.

Conclusions:

Fertility regulation is a multifaceted problem which affects the health and well-being of mankind. When faced with the sheer magnitude of the issue, divergent views are inevitable. There are a group of

scientists who insist that all contraceptive methods should undergo controlled clinical trials and extensive epidemiological investigations for long periods to document health hazards, even the rarer ones, before being released for mass use. Even then there should be a statuatory warning regarding possible rare side effects and all women should be carefully followed up with several screening procedures. This is an obviously impossible proposition, physically and financially, under the conditions that exist in developing countries and may tax the existing resources even in developed countries. The other extreme group advocates free liberal distribution of any contraceptive even through non-medical outlets, because in any health care set-up the risks associated with contraceptive use are but a fraction of health hazards associated with pregnancy and delivery. The debate is relatively academic as far as developed countries are concerned because women do have access to adequate medical facilities but becomes vital when decisions have to be made regarding provision of contraceptive services to women in developing countries.

Obviously both these extreme views are not tenable. Evaluation of risks and benefits of different methods under the existing conditions of health status and health care delivery is essential for choice of the most appropriate contraceptive method associated with minimal health hazards. Use of risk care approach *i.e.*, of identification of women at risk by using simple tests and provision of appropriate follow up measures will go a long way in providing safe, effective contraceptive care in developing countries. Though it is not very easy to set up such a contraceptive care system, the long-term dividends for such an investment in terms of acceptance and continued use of contraceptives and fall in birth rate may make this a worth while endeavour.

Another major problem is the repeated claim that one or other of the contraceptive methods is the solution to the population problem. Such claims include slogans such as "pill for eradication of population problem", "tubectomy is the only answer to population explosion in developing countries". Rival contentions regarding merits and demerits of one method versus the other often do a lot of harm to acceptance of any method. We have to accept the fact that at the moment there is no ideal contraceptive free from side effects and complications suitable for use in all women. Nor is any such method likely to emerge during the foreseeable future. We do, however, have a variety of methods from which the most appropriate method for any couple can be chosen.

The resources of the nation and individual, the socio-cultural milieu, health status, health care delivery systems and needs of the individual should all be taken into consideration for choosing the appropriate contraceptive method. A variety of contraceptive methods can and should co-exist and such a variety is essential for the better acceptance of the small family norm.

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This write-up is based on the Kshanika Award (1980) Oration delivered by Dr. K. Prema, Assistant Director, National Institute of Nutrition, Hyderabad.

ICMR NEWS

Expert Group/Task Force Meetings

The following ICMR Expert Groups/Task Forces met during the month:-

Task Force on Male Contraception	December 2-4, 1981
Expert Group on Polio and Measles Immunisation Policy	December 19, 1981
Study Group on Leprosy	December 21-22, 1981

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An Indonesian delegation led by Dr. Suwardjono Surjaningrat, Minister of Health, Republic of Indonesia, visited the Council on December 3, 1981, and had discussions with senior scientists.

A six membered Chinese delegation on Traditional Chinese Medicine visited the Council on December 18, 1981, and had discussions with Dr. V. Ramalingaswami and Dr. G.V. Satyavati.

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As part of the Silver Jubilee Celebrations of the Tuberculosis Research Centre, Madras, a symposium on Chemotherapy and Management of Tuberculosis was held in Madras on December 16-17, 1981.

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Dr. P.K. Rajagopalan, Director, Vector Control Research Centre, Pondicherry, participated in a meeting of the WHO Expert Committee on Biological Control of Vectors held at Geneva between December 1-7, 1981.

Dr.V.Ramalingaswami, Director-General, ICMR, delivered the Dr. B.C. Roy Centenary Oration under the auspices of the Indian Medical Association, Calcutta, on December 11, 1981.

Dr. V. Ramalingaswami inaugurated the 22nd Annual Conference of the Indian Society of Haematology and Blood Transfusion at Calcutta, on December 11, 1981.

Dr. V. Ramalingaswami participated in the meeting of the SEA/ACMR sub-committee on Health Services Research held at Jakarta, Indonesia, between December 23-29, 1981.

Dr. S. Sriramachari, Director, Institute of Pathology, New Delhi, inaugurated a Workshop on Medical Mycology at the National Institute of Communicable Diseases, Delhi, on December 28, 1981.

PROGRAMME OF SCIENTIFIC LECTURES AT THE INDIAN COUNCIL OF MEDICAL RESEARCH, NEW DELHI

Date	Topic	Speaker
24.12.1981	Circulatory Responses to High Altitude	Dr. S.C. Manchanda, New Delhi.

ICMR AIDED SYMPOSIA/SEMINARS/WORKSHOPS/CONFERENCES

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
International Symposium on Incidence of Infections and Chronic Diseases - Geographical Perspectives.	December 1-4, 1981	Department of Geography, University of Madras, Madras.
International Symposium on Theory of Living State.	December 13-19, 1981	Department of Biophysics, All India Institute of Medical Sciences, New Delhi.
International Conference on the Applications of Mossbauer Effect.	December 14-18, 1981	Jaipur (Indian National Science Academy).

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
Workshop on Essential Streptococcus Bacteriology and Serology for Community Control of Rheumatic Fever/ Rheumatic Heart Disease.	December 14-19, 1981	Department of Microbiology, ICMR-WHO Streptococcal Diseases Reference Laboratory, Lady Hardinge Medical College, New Delhi.
Symposia on Nutrition & Environment and Current Concepts in Membrane Biochemistry.	December 21-24, 1981	Department of Biochemistry, University Colleges of Sciences, Calcutta.
30th Annual Conference on the Anatomical Society of India.	December 28-30, 1981	Medical College, Trivandrum.
Workshop on Manpower Planning for Health and Development.	January 6-8, 1982	Department of Community Health, Christian Medical College, Vellore (Association of Preventive and Social Medicine).
International Workshop on Nutrition and the Development of the Child.	January 8-15, 1982	Department of Biochemistry, M.S. University, Baroda.
Seminar on Social Aspects of Health and Medical Services.	January 15-17, 1982	University of Jodhpur, Jodhpur.
Symposium on Educational Consequences of Accepting the Concept of Comprehensive Health Care.	January 30 - February 1, 1982	Goa Medical College, Panaji (Indian Association for Advancement of Medical Education).
National Seminar on Health for All - A National Dialogue on Operational Aspects of Comprehensive Primary Health Care and Rural Development.	February 6-7, 1982	Birla Institute of Medical Research, Gwalior.
Workshop on Techniques Employed in Urolithiasis Research.	February 10-14, 1982	Department of Biochemistry, Postgraduate Institute of Medical Education and Research, Chandigarh (Urolithiasis Society of India).
Workshop on Evaluation of Mutagenic Potential of Environmental Agents: Microbial and Mammalian Systems.	February 15-19, 1982	Division of Biochemistry and Food Technology, Bhabha Atomic Research Centre, Bombay (Environment Mutagen Society of India).
International Symposium on Primates.	February 17-19, 1982	Department of Zoology, University of Jodhpur, Jodhpur (Primatological Society of India)

Symposium/Seminar/Workshop/ Conference	Date	Institution/Department
Symposium on Vectors and Vector-Borne Diseases.	February 26-28, 1982	Department of Zoology, University of Kerala, Trivandrum.
International Symposium on Occupational Health Problems in Developing Countries.	February, 1982	National Institute of Occupational Health, Ahmedabad.
Symposium on Internal Auditory Canal Surgery.	March 15-17, 1982	Department of Otolaryngology, All India Instiatute of Medical Sciences, New Delhi (Neuro-otological and Equilibriometric Society of India).

COUNCIL'S TRAINING PROGRAMMES FOR 1981

Leprosy:

At the Central Jalma Institute for Leprosy, Agra:

Training course in Leprosy for medical officers: (February 15 to March 28, 1981, and August 31 to October 14, 1981).

Virology:

At the National Institute of Virology, Pune:

(1) Diploma course in Medical Virology of Poona University: (July, 1981).

(2) *Workshop on Japanese Encephalitis in India.

Endocrinology:

At the National Institute of Nutrition, Hyderabad:

Annual certificate course in Endocrinological Techniques and their Application: (August to September, 1981).

Nutrition:

At the National Institute of Nutrition, Hyderabad:

(1) Annual certificate course in Human Nutrition for teachers from Agricultural Universities: (June/July, 1981).

(2) M.Sc. (Applied Nutrition) course: (June 1, 1981 to February 28, 1982).

(3) Annual certificate course in Public Health Nutrition: (October/November, 1981).

(4) Annual certificate course in Nutrition (December 1, 1981 to February 28, 1982).

Haematology:

At the Blood Group Reference Centre, Bombay:

(1) A certificate course in Blood Banking Technology and Basic Haematology for medical officers: (February 1 to March 15, 1981).

(2) Training course in Blood Banking Methodology for technicians: (May 12-26, 1981).

Mental Health:

At Bangalore, Chandigarh and Delhi:

Training course on Extension of Mental Health Services in the Community: (July 18 - August 29, 1981).

Occupational Health:

At the National Institute of Occupational Health, Ahmedabad:

NIOH/WHO Training Course on Air Pollution and Health: (December 1-10, 1981).

Oncology:

At the Cancer Research Institute, Tata Memorial Centre, Bombay:

Training course on Carcinogenicity, Mutagenicity and Teratogenicity: (December, 1981).

Clinical Pharmacology:

*At the Department of Pharmacology, Seth G.S. Medical College, Bombay.

Biostatistics:

At the Institute for Research in Medical Statistics, New Delhi:

(1) Certificate course in Planning and Evaluation of Health Programmes: (April, 1981).

(2) Diploma course in Biostatistics: (September, 1981).

(3) Certificate course in Orientation to Biostatistics: (September, 1981).

(4) Certificate course in Statistical Techniques in Medical Research: (January, 1982).

Laboratory Animal Technology:

At the National Institute of Nutrition, Hyderabad:

(1) Laboratory Animal Supervisors Training Course: (January 2 to March 31, 1981).

(2) Laboratory Animal Technicians Training Course: (August 1 to September 30, 1981).

COURSES FOR TALENT SEARCH SCHEME FELLOWS

Cell-Biology and Cyto-Genetics:

At the Indian Institute of Science, Bangalore: (March, 1981).

Use of Radioisotopes in Medicine:

At the National Institute of Nutrition, Hyderabad: (July, 1981).

Immunological Techniques:

At the Central Jalma Institute for Leprosy, Agra: (November, 1981).

Haematological Techniques:

*At the Department of Pathology, Christian Medical College, Vellore.

Clinical Endocrinology:

*At the Institute for Research in Reproduction, Bombay.

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*Dates to be announced later.

SOME ICMR PUBLICATIONS

	Price Rs.
Menus for Low-Cost Balanced Diets and School Lunch Programmes suitable for South India (1959), Third Edition 1977, Reprinted 1978	1.50
Menus for Low-Cost Balanced Diets and School Lunch Progarammes suitable for North India (1959), Second Edition 1977	1.50

	Price Rs.
Nutrition for Mother and Child (1962), Third Edition 1978	3.50
Some Common Indian Recipes and Their Nutritive Value (1964), Fourth Edition 1977, Reprinted 1980	6.50
Nutritive Value of Indian Foods (1971), Reprinted 1981	9.00
Diet Atlas of India (1971)	8.00
Nutrition Atlas of India (1971)	10.50
Atlas of Histopathology of Liver: Hepatitis and Cirrhosis (1974)	10.00
Studies on Pre-School Children (1974), Reprinted 1977	3.50
Studies on Weaning and Supplementary Foods (1974), Reprinted 1977	4.00
Medicinal Plants of India, Vol. I (1976)	30.00
Research in Malaria - An Outline (1977)	Gratis
Health Hazards of Mycotoxins in India (1978)	5.00
Japanese Encephalitis in India, Revised Edition 1980	5.00
Recommended Dietary Intakes for Indians (1981)	4.00

These publications are available on prepayment of cost by cheque or postal order (bank and postal charges will be extra) drawn in favour of the Director-General, Indian Council of Medical Research, New Delhi. Money orders are not acceptable. All correspondence in this regard should be addressed to the Chief, Division of Publication and Information, Indian Council of Medical Research, Post Box 4508, Ansari Nagar, New Delhi-110029.

ICMR AWARDS

Dr. M.K. Seshadri Prize for 1981 has been jointly awarded to Dr. N.N. Wig, Professor and Head, Department of Psychiatry, All India Institute of Medical Sciences, New Delhi, and Dr. R.S. Murthy, Assistant Professor, Department of Psychiatry, Postgraduate Institute of Medical Education and Research, Chandigarh, for their contributions in the field of Community Mental Health.

INDIAN COUNCIL OF MEDICAL RESEARCH

Applications are invited for the award of fellowships to Cytotechnicians (6) and Cytotechnologists (4) for training in the field of Cytology at the following Institutes:-

1. Postgraduate Institute of Medical Education and Research, Chandigarh.
2. Cytology Research Centre, New Delhi.
3. All India Institute of Medical Sciences, New Delhi.

Junior Research Fellowship awarded to Cytotechnologists carries a stipend of Rs.600/- p.m. for a period of one year. The Cytotechnicians will be awarded Technician Training Fellowship of Rs.250/- p.m. for six months. Interested candidates have to produce an undertaking from their parent institution that it has the necessary laboratory infrastructure and the candidate's expertise will be utilized appropriately after completion of training. The last date for receipt of completed applications, on prescribed forms obtainable from the Director-General (Division of CAR-II), Indian Council of Medical Research, Post Box 4508, Ansari Nagar, New Delhi-110029, is February 28, 1982.

Tropical Diseases Research (TDR) Programme

The Indian Council of Medical Research has been appointed as the nodal point for processing proposals for the TDR programme of the WHO in the fields of Malaria, Filariasis, Leprosy, Leishmaniasis including biological control of the vectors. The programme will involve not only applied research in these fields but also basic research including biological, immunological, epidemiological and socio-economic aspects.

Proposals for financial assistance under the TDR programme may be sent in the prescribed proforma to the Director-General, Indian Council of Medical Research, Ansari Nagar, New Delhi-110029.

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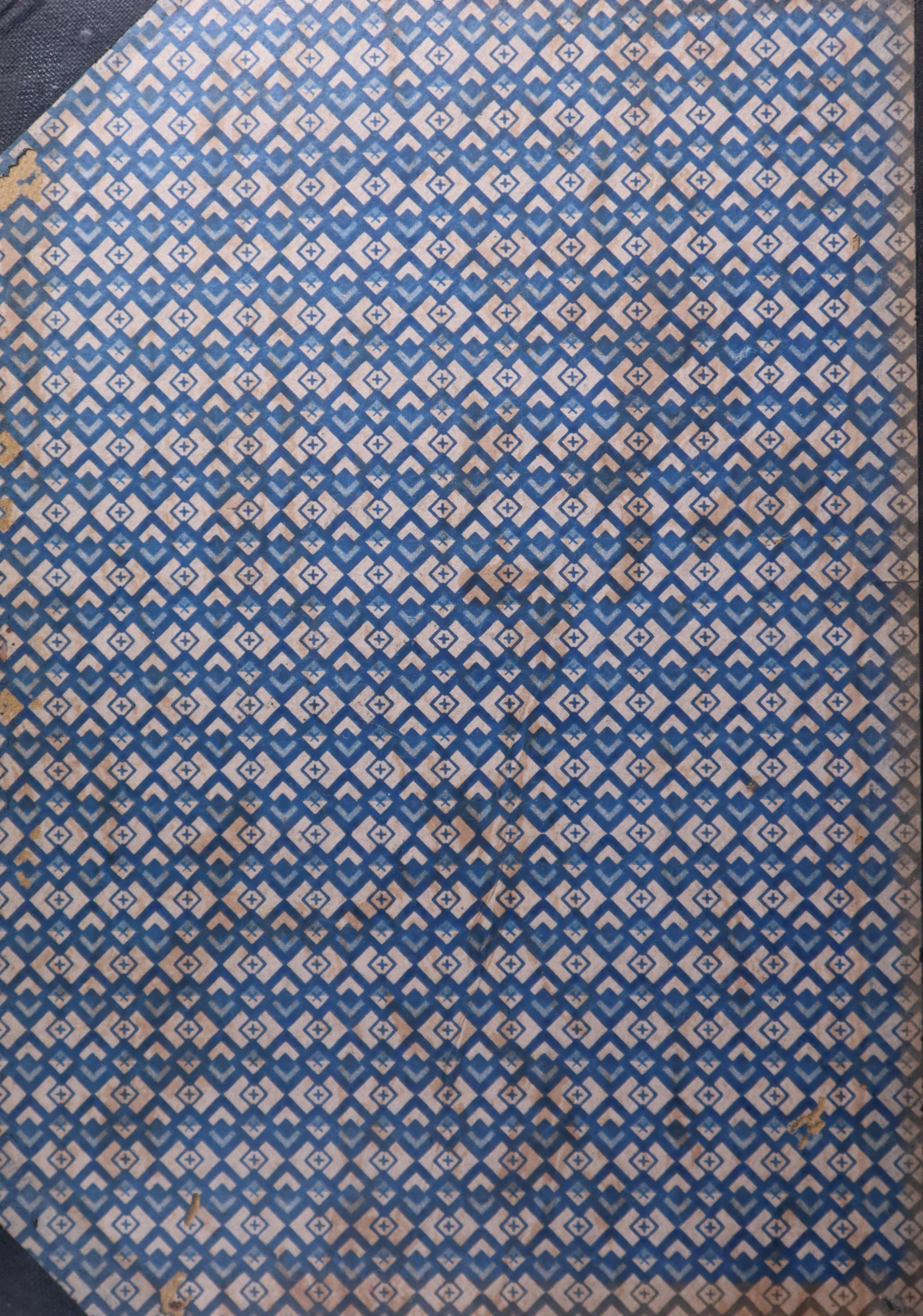
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